Baker County
Emergency Operations Center

3410 K St.
Baker City, Oregon 97814

Project Specification Manual
BID SET

7/8/2025

COLE/ARCHITECTS
1000 NW Wall Street, Suite 205
Bend, Oregon 97703
Project Number 23-105-OR

SECTION 00 00 01 – PROJECT TEAM

PROJECT
Baker County Emergency Operations Center
3410 K Street
Baker City, OR 97814

OWNER
Baker County Facilities Department
1995 3rd Street, Suite 60
Baker City, OR 97814
Phone: (541) 523-6416
Facilities Director: Daniel McQuisten
dmcquisten@bakercountyor.gov

ARCHITECT & INTERIOR DESIGN
Cole Architects
1000 NW Wall St, Suite 205
Bend, OR 97703
Phone: (541) 208-7025
Project Arch: Aaron Buckman
aaronb@colearchitects.com

CIVIL ENGINEER
Nasland Engineers
1109 W. Main St., Suite 660
Boise, ID 83702
Phone: (208) 593-4676
Office Leader: Mike Nasland, PE
miken@nasland.com

STRUCTURAL ENGINEER
CB Const, Inc.
1202 Adams Ave
La Grande, OR 97850
Phone: (541) 786-5315
Office Leader: Derek Howard, PE
dhoward@cbconst.us

MECHANICAL, ELECT, & PLUMB ENGINEERS
Sazan Engineers
1030 NW Bond St., Suite 202
Bend, OR 97703
Phone: (503) 416-2078
Project Manager: Max Malany
mmalany@sazan.com

GENERAL CONTRACTOR

TBD – Public Bid

END OF SECTION

TABLE OF CONTENTS OF SPECIFICATIONS

000101 TITLE PAGE
000103 PROJECT TEAM
000110 TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

001113 ADVERTISEMENT FOR BIDS

002113 INSTRUCTIONS TO BIDDERS
004100 BID FORM
005200 AGREEMENT
006113 PERFORMANCE BOND
006240 OUT OF STATE
007000 GENERAL CONDITIONS
007300 SUPPLEMENTAL GENERAL CONDITIONS

SPECIFICATIONS GROUP

GENERAL REQUIREMENTS SUBGROUP

DIVISION 01 - GENERAL REQUIREMENTS

011000 SUMMARY OF WORK
012300 ALTERNATIVES
012500 SUBSTITUTION PROCEDURES
012613 REQUESTS FOR INTERPRETATIONS
012663 CHANGE ORDER PROCEDURES
012900 APPLICATIONS FOR PAYMENT
012973 SCHEDULE OF VALUES
013100 PROJECT COORDINATION
013119 MEETINGS
013126 ELECTRONIC MANAGEMENT PROCEDURES
013200 SCHEDULES AND REPORTS
013300 SUBMITTAL PROCEDURES
014000 QUALITY REQUIREMENTS
014200 REFERENCE STANDARDS
014510 QUALITY CONTROL – SAFETY
015000 TEMPORARY FACILITIES & CONTROLS
015526 TRAFFIC CONTROL
016600 DELIVERY, STORAGE & HANDLING
017123 CONSTRUCTION STAKING
017329 CUT & PATCH
017413 CLEANING

017419 CONST. WASTE MANAGEMENT & DISPOSAL
017800 CONTRACT CLOSEOUT
017823 O&M DATA
017839 RECORD DOCS
019000 UTILITY LOCATIONS
019100 GENERAL COMISSIONING (Cx)

DIVISION 02 - EXISTING CONDITIONS
023200 GEOTECHNICAL INVESTIGATIONS
023210 GEOTECHNICAL ENGINEERING REPORT
024119 SELECTIVE DEMOLITION

DIVISION 03 - CONCRETE
031000 CONCRETE FORMWORK AND ACCESSORIES
032000 CONCRETE REINFORCEMENT
033000 CAST-IN-PLACE CONCRETE

DIVISION 05 - METALS
051200 STRUCTURAL STEEL FRAMING
053100 STEEL DECKING
055000 METAL FABRICATIONS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
061000 ROUGH CARPENTRY
064023 INTERIOR ARCHITECTURAL WOODWORK
066400 PLASTIC PANELING

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
071416 COLD FLUID-APPLIED WATERPROOFING
071900 WATER REPELLENTS
072100 THERMAL INSULATION
072413 POLYMER-BASED EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)
075423 THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING
076200 SHEET METAL FLASHING AND TRIM
077100 ROOF SPECIALTIES
077129 MANUFACTURED ROOF EXPANSION JOINTS
077200 ROOF ACCESSORIES
078413 PENETRATION FIRESTOPPING

DIVISION 08 - OPENINGS
081113 HOLLOW METAL DOORS AND FRAMES
083113 ACCESS DOORS AND FRAMES
084000 ALUMINUM ENTRANCE & WINDOW SYSTEMS
085123.23 COLD-ROLLED STEEL WINDOWS
085619 SERVICE WINDOW

086200 UNIT SKYLIGHTS
087100 DOOR HARDWARE
088000 GLAZING
088300 MIRRORS
089000 LOUVERS AND VENTS

DIVISION 09 - FINISHES

092216 NON-STRUCTURAL METAL FRAMING
092900 GYPSUM BOARD
095113 ACOUSTICAL PANEL CEILINGS
096513 RESILIENT BASE AND ACCESSORIES
096519 RESILIENT TILE AND PLANK FLOORING
096536 STATIC-CONTROL RESILIENT FLOORING
096813 TILE CARPETING
096900 ACCESS FLOORING
099113 EXTERIOR PAINTING
099123 INTERIOR PAINTING

DIVISION 10 - SPECIALTIES

101400 INTERIOR SIGNAGE
101413 EXTERIOR SIGNAGE
102600 WALL AND DOOR PROTECTION
102800 TOILET, BATH, AND LAUNDRY ACCESSORIES
104100 EMERGENCY ACCESS AND INFORMATION CABINETS
104413 FIRE PROTECTION CABINETS
104416 FIRE EXTINGUISHERS
107313 AWNINGS

DIVISION 22 - PLUMBING

220517 SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING
220523 GENERAL-DUTY VALVES FOR PLUMBING PIPING
220529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
220553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
220719 PLUMBING PIPING INSULATION
221005 PLUMBING PIPING
221006 PLUMBING PIPING SPECIALTIES
223000 PLUMBING EQUIPMENT

DIVISION 23 – HEATING, VENTILATION, AND AIR-CONDITIONING (HVAC)

230130.51 HVAC AIR-DISTRIBUTION SYSTEM CLEANING
230513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

230516 EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING
230548 VIBRATION AND SEISMIC CONTROLS FOR HVAC
230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713 DUCT INSULATION
230719 HVAC PIPING INSULATION
230923 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC
230993 SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
231123 FACILITY NATURAL-GAS PIPING
233100 HVAC DUCTS AND CASINGS
233300 AIR DUCT ACCESSORIES
233319 DUCT SILENCERS
233423 HVAC POWER VENTILATORS
233700 AIR OUTLETS AND INLETS
237413 PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

DIVISION 26 - ELECTRICAL

260505 SELECTIVE DEMOLITION FOR ELECTRICAL
260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533.13 CONDUIT FOR ELECTRICAL SYSTEMS
260533.16 BOXES FOR ELECTRICAL SYSTEMS
260548 VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
260583 WIRING CONNECTIONS
260923 LIGHTING CONTROL DEVICES
262416 PANELBOARDS
262726 WIRING DEVICES
262733 POWER DISTRIBUTION UNITS
262811.11 MOLDED CASE/INSULATED CASE CIRCUIT BREAKERS – SCHNEIDER ELECTRIC SQUARE D POWERPACT/MASTERPACT
262813 FUSES
262816.16 ENCLOSED SWITCHES
263213 ENGINE GENERATORS
263323 CENTRAL BATTERY EQUIPMENT
263353 STATIC UNINTERRUPTIBLE POWER SUPPLY

263600 TRANSFER SWITCH
264300 SURGE PROTECTIVE DEVICES
265100 INTERIOR LIGHTING
265600 EXTERIOR LIGHTING

DIVISION 27 – COMMUNICATIONS

270529 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
270533.13 CONDUIT FOR COMMUNICATIONS SYSTEMS
270536 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
271000 STRUCTURED CABLING

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

281000 ACCESS CONTROL
282000 VIDEO SURVEILLANCE
284600 FIRE DETECTION AND ALARM

DIVISION 31 - EARTHWORK

NONE REFER TO BAKER CITY STANDARDS AND SPECIFICATIONS

DIVISION 32 - EXTERIOR IMPROVEMENTS

323300 SITE FURNISHINGS

DIVISION 33 - UTILITIES

NONE REFER TO BAKER CITY STANDARDS AND SPECIFICATIONS

END OF SECTION

SECTION 00 11 13 – ADVERTISEMENT FOR BIDS

BAKER COUNTY FACILITIES DEPARTMENT
1995 3rd Street, Suite 60
Baker City, OR 97814
Baker County Emergency Operations Center
July 31, 2025 at 2:00 PM Current Local Time
Invitation to Bid

Project: Emergency Operations Center
Solicitation Number: RFP 2025-03
Closing Date/Time: July 31, 2025, 2pm PST
Baker County Contact: Daniel McQuisten
Email: dmcquisten@bakercountyor.gov
Mandatory Prebid Meeting: July 15, 2025, at 2:00 PM prevailing local time (In Person) at the Emergency Operations Center project site: 3410 K Street, Baker City, OR 97814.
Scope of Work: Scope of work for this bid includes but is not limited to the Construction of Baker County Emergency Operations Center.
Response: Sealed bids will be received by Daniel McQuisten, Baker County Facilities Director, at the Baker County Courthouse Building, 1995 3rd Street, Front Desk, Baker City, Oregon, 97814, by the time and date listed above. The bids will then be publicly opened and read aloud Room 106 Commission Chambers. 1st Tier Subcontractor Disclosure Statements are due by 4:00 PM on the above date for bids to be considered for award. Bids and 1st Tier Subcontractor Disclosure Statements received after the required time and date time will not be considered.
Solicitation Documents: Bidding documents are those prepared by Cole Architects, 1000 NW Wall Street, Suite 205, Bend, Oregon 97703, and (541)383-1898. Bidding documents may be obtained from the Central Oregon Builders Assoc. (COBA), 1051 NE 4th St., Bend OR 97703, 541-389-1058 or online at: www.coba.org and at the Baker County link https://www.bakercountyor.gov under Current Solicitations. Bidding documents will be available for examination during the bidding period at Baker County Facilities Office and at Cole Architects.

This project is a PREVAILING WAGE project therefore no bid will be received or considered unless the Bid contains a statement by the bidder, as part of the bid, that "Contractor agrees to be bound by and will comply with the applicable provisions of 279C.838, 279C.840 or 40 U.S.C. 3141 to 3148."

Publish Date: July 9, 2025
July 11, 2025

END OF SECTION

SECTION 00 21 13 – INSTRUCTION TO BIDDERS

1.1 SUBMISSION OF BIDS AND BID OPENING:

A. In accordance with ORS 279C.365, bids will be received by Daniel McQuisten, Baker County Facilities Director for the Baker County Emergency Operations Center, and will be opened and read aloud at the times and places set forth in the Advertisement for Bids. Bidders, or their representatives, and other interested persons may be present at the opening of proposals.

B. The envelope containing the Bid form and required attachments must be sealed and addressed to Daniel McQuisten, Baker County Facilities Director, Baker County, Oregon, 1995 3rd Street, Baker City, Oregon 97814, and marked on the outside: "Baker County Emergency Operations Center", with name of the Bidder and its Oregon State Construction Contractor's Board Registration Number. A similar, separate envelope shall be used to submit the First-Tier Subcontractor Disclosure Statement at the time and location identified in the Advertisement for Bids.

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

1.2 BIDDING DOCUMENTS:

A. Bidding Documents include the Advertisement for Bids, Instructions to Bidders, Bid Form, First Tier Subcontractor Disclosure Statement, the Bid Bond, Affidavit of Non-Collusion, the Statement of Qualifications, and the proposed Contract Documents, including any Addenda issued prior to receipt of bids. All requirements and obligations of the Bidding Documents are hereby incorporated by reference into the Contract Documents and are binding on the Successful Bidder upon award of the Contract.

B. Bidders may obtain complete sets of the Bidding Documents as designated in the Advertisement for Bids. Bidders are responsible for all costs of reproduction.

C. Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the County or the Architect shall assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

D. The County, in making copies of the Bidding Documents available on the above terms, does so only for the purpose of obtaining Bids on the Work and does not confer a license or grant authority for any other use.

1.3 DEFINITIONS**:**

A. THE BID:

A Bid is a complete and properly signed offer to do the work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

B. BASE BID:

The Base Bid is the sum stated in the Bid for which the Bidder offers to perform all the Work shown and described in the Bidding Documents as a lump sum bid, to which Work may be added or deducted for the sums stated in Alternate Bids, if any.

C. ALTERNATES:

An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted by the County. Any or all Alternates may be accepted or rejected in any order.

1.4 QUALIFICATIONS OF BIDDERS**:**

A. Before the Bid is considered for award, the County shall review the bidder qualification form submitted with Bidder's Bid. Bidder qualifications to be listed upon the qualification form will include as a minimum, a listing of Bidder's previous contracts of a nature similar with technical complexity, operations and size to that being bid upon; a listing of Bidder's staff to include managerial, technical, and laboring positions; summary of Bidder's plan for completion of the Work and equipment available for use in the execution of the Contract; and the listing of the projects to which Bidder is currently obligated or anticipates being obligated during this Work. The County reserves the right to request the Bidder submit the following additional information within seventy-two (72) hours after Bid opening: (1) references, to include a listing of previous and current projects, (2) financial statements indicating current financial status, prepared in accordance with generally accepted accounting principles, by a Certified Public Accountant licensed to do business in the State of Oregon, and (3) Contractor's Drug Testing policy in accordance with ORS 279C.505(2). The County reserves the right to reject the Bid of any Bidder who fails to furnish promptly and properly all the information called for as aforesaid when notified to do so.

B. Pursuant to ORS 279C.440, a Bidder may be disqualified from consideration for award of County contracts if any of the following conditions appear:

1. Bidder has been convicted of a criminal offense as an incident to obtaining or attempting to obtain a public or private contract or subcontract, or in the performance of such contract or subcontract.
2. Bidder has been convicted under state or federal statutes of embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property or any other offense indicating a lack of business integrity or business honesty that currently, seriously and directly affects the Bidder's responsibility as a contractor.
3. Bidder has been convicted under state or federal antitrust statutes.
4. Bidder has committed a violation of a contract provision that is regarded by the County or the Construction Contractors Board to be so serious as to justify disqualification. A violation may include but is not limited to a failure to perform the terms of a contract or an unsatisfactory performance in accordance with the terms of the contract. However, a failure to perform or an unsatisfactory performance caused by acts beyond the control of the Bidder may not be considered to be a basis for disqualification.
5. Bidder does not carry workers' compensation or unemployment insurance as required by statute.

C. Bidder's representations concerning its qualifications will be construed as a covenant under the Contract. Should it appear that Bidder has made a material misrepresentation, County shall have the right to terminate the Contract for Contractor's breach, and County may then pursue such remedies as exist elsewhere under this Contract, or as otherwise are provided at law or equity.

D. The County shall issue a written decision to disqualify a Bidder under ORS 279C.440. Such decision will identify the reasons why the Bidder is disqualified. The Bidder may appeal its disqualification pursuant to ORS 279C.445.

1.5 BIDDER'S REPRESENTATIONS**:** Each Bidder by submitting its Bid represents that:

A. Bidder has read and understands the Bidding Documents and its Bid is made in accordance therewith; and Bidder agrees to be bound by the terms and requirements set forth in the Bidding and Contract Documents.

B. Bidder has visited the site, has familiarized itself with the local conditions under which the Work is to be performed in accordance with Paragraph 12 herein, and has correlated its observations with the requirements of the proposed Contract Documents.

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

D. Bidder has the capability, in all respects, and the moral and business integrity, reliability, technical ability, financial resources, physical plant, management, superintendence, equipment and materials which will assure effective and efficient good-faith performance in full compliance with the Contract Documents and with any and all schedules and completion dates required by the County.

E. The Bidder acknowledges and represents that it has made allowances for normal inclement weather indigenous to the Project Site, in its estimating, planning and scheduling of the Work.

F. The Bidder further acknowledges that the Contract Documents are, in its opinion, appropriate and adequate for completing this project and for the construction of sound and suitable work.

G. The Bidder hereby certifies that the Work shall be completed, in place, in full accordance with the Contract Documents, within the time limits specified.

1.6 PREPARATION AND SUBMITTAL OF BID FORM**:**

A. Bids shall be submitted utilizing the Bid Form provided with the Bidding Documents, and shall be complete in every respect. The total Bid amount shall be entered in words and figures in the space provided. Where applicable, the unit price of lump sum items, and their extensions, shall be entered in figures in the respective columns provided for each bid item. All entries shall be typewritten or printed in ink. The signatures of all persons shall be in longhand. Any entry of an amount that appears on the face of the bid to have involved an erasure, deletion, whiteout, substitution and/or other such change or alteration shall be initialed by the person signing the bid and show the date of the change or alteration. A failure to comply with this requirement may be cause for disqualification of the Bid.

B. For lump sum Bids, in the event of a discrepancy between the Bid amount in writing and that in figures, the written value shall govern.

C. Bids shall not contain any restatement or qualifications of work to be done, and alternate bids will not be considered unless called for. No oral, email, facsimile or telephonic bids or modifications will be considered.

D. Bids shall be delivered to the County on or before the day and hour set for the receipt of bids, enclosed in a sealed, opaque envelope and bearing the title of the work, name of the Bidder and Bidder's CCB Registration Number.

1.7 BID SECURITY**:**

A. Each Bid must be accompanied by bid security in the form of: (1) an irrevocable letter of credit; or (2) a cashier's check or a Certified Check of the Bidder, made payable to the County; or (3) a surety bond on the Bid Bond Form provided herein or on a similar form which in every respect materially complies with said Bid Bond. Bid security shall be in the amount of ten percent (10%) of the Base Bid plus any positive alternate amounts. Any Bid Bond shall be issued by a Surety company licensed to conduct business in the State of Oregon and be acceptable to the County. The Surety signing the Bid Bond shall be registered with the Oregon State Insurance Commissioner, and the Surety's name shall appear in the current Authorized Insurance Company list in the State of Oregon published by the office of the Insurance Commissioner. Each Surety's name must also appear on the United States Treasury Department's list of authorized sureties, circular 570, as amended.

B. The Bid security is given as a guarantee that the Bidder will enter into a Contract if awarded the Work and, in the case of refusal or failure to so enter into said Contract, the security shall be declared forfeited to the County, in accordance with ORS 279C.385. Such security shall be returned to all but the three (3) lowest Bidders within seven (7) days after the opening of the Bids and the remaining securities will be returned within forty-eight (48) hours after the County and the successful Bidder have executed the Contract. If no Contract has been awarded or the Bidder has not been notified of the acceptance of its Bid, within thirty (30) days of the Bid opening, the Bidder may withdraw its Bid

and request the return of its Bid security. If, at the County's request, the Bidder agrees to extend and maintain its' Bid beyond the specified thirty (30) days, its Bid security will not be returned until after the County and the Successful Bidder have executed the Contract.

1.8 INSURANCE BINDER**:**

A. Each Bid shall be accompanied by a letter or form from the Bidder's insurance company stating that upon award of the Contract the types and amount of insurance required elsewhere in these specifications will immediately become effective.

1.9 UNIT PRICES**:**

A. The Bidder shall include in the spaces provided on the Bid Form a Bid for each unit price.

B. The County may accept or reject any or all of these unit prices and include them in the Contract. The County is not obligated to use these unit prices and may require the Contractor to provide a complete breakdown of costs listed therein.

1.10 STATEMENT OF QUALIFICATIONS:

Each bid shall be accompanied by a Statement of Qualification completed on the form included herein or on a similar form, which materially includes the information requested.

1.11 LIQUIDATED DAMAGES (Forfeiture of Security Deposit):

The successful Bidder, upon its failure or refusal to execute the Contract within ten (10) days after it has received a Notice of Intent to Award, shall forfeit to the County the security deposited with its Bid, as liquidated damages for such failure or refusal.

1.12 SITE CONDITIONS AND CONDITIONS OF THE WORK:

A. Each Bidder must acquaint itself thoroughly as to the character and nature of the Work to be done and the conditions under which the work will be performed. Each Bidder furthermore must make a careful examination of the site of the Work and inform itself fully as to the difficulties to be encountered in the performance of the Work, the facilities for delivering, storing and placing materials and equipment, existing and available services and utilities, environmental and access constraints, permit requirements and other conditions relating to construction and labor.

B. The Successful Bidder, subject to Paragraph 12.6 of the General Conditions, Section 00 7000, entitled "Differing Site Conditions", assumes all risk as to the nature and behavior of the soil or subsurface conditions which underlie the Work or is adjacent thereto, or difficulties that may be due to any unfavorable conditions that may be encountered in the Work, whether apparent on surface inspection or disclosed after construction begins.

C. No plea of ignorance of conditions that exist or may hereafter exist on the site of the Work, or difficulties that may be encountered in the execution of the Work, as a result of failures to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of the Successful Bidder to fulfill in every detail all the requirements of the Contract Documents and to complete the Work for the consideration set forth therein, or as a basis for any claim whatsoever.

D. Insofar as possible, the Successful Bidder, in carrying out its work, must employ such methods or means as will not cause interruption of or interference with the Work of the County or any separate Contractor.

E. The Contract includes excavation on an unclassified basis. The cost of all excavation and backfill required under this Contract is a part of the Base Bid. No distinction will be made insofar as payment is concerned between earth and rock.

F. ☐ If box is checked, either Bidder or a subcontractor must be licensed under ORS 468A.720 regarding asbestos abatement.

1.13 BIDDER'S QUESTIONS, ADDENDA AND INTERPRETATIONS:

A. Bidders and Sub-Bidders shall promptly notify the County of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding and Contract Documents or of the site and local conditions. No interpretation of the meaning of the drawings, specifications or other Contract Documents will be made to any Bidder orally.

B. Every request for such technical and design interpretation shall be in writing addressed to COLE Architects, 1000 NW Wall St. #205, Bend OR 97703. To be given consideration the request must be received by the Architect at least seven (7) calendar days prior to the date fixed for the opening of the Bids.

C. Any and all such interpretations and any supplemental instruction will be in the form of written addenda to the Bidding Documents which, if issued, will be mailed or transmitted via email to all prospective Bidders (to the respective addresses and email addresses furnished for such purposes) not later than seventy-two (72) hours prior to the date and time fixed for the opening of the Bids. (Each Bidder wishing to receive notice of addenda shall register as a prime bidder with Central Oregon Builders Association (COBA) 1051 NE 4th Street, Bend, Oregon 97703. The County will be responsible for any other explanations or interpretations of the proposed documents. Failure of any Bidder to receive any such addendum or interpretation shall not relieve any Bidder from any obligation under its Bid as submitted. All addenda so issued shall become a part of the Contract Documents.

D. If the Bidder (or any person bidding to Bidder and/or subsequently in contract with the Bidder, relating to the subject project) knows, or should have known, that an ambiguity, discrepancy, error, omission or conflicting statement exists in the Bidding or Contract Documents, said Bidder (or sub-bidder) has an obligation to seek a clarification thereof from the County prior to the Bid. The County will welcome such a clarification request, and, if deemed necessary by the County, the County will issue a written addendum clarifying the matter in question. Change orders presented at the initial meeting between the County and the Contractor will be presumed to have been the proper subject of a clarification and will be disallowed.

E. Each Bidder shall ascertain prior to submitting its Bid that it has received all Addenda issued and shall acknowledge receipt and inclusion in its Proposal of all Addenda.

1.14 PROTEST PROCESS:

A. A Bidder may protest the Specifications or Contract terms and conditions by delivering a written protest on those matters to the County not less than ten (10) days prior to the date fixed for the opening of the Bids. All protests of Specifications or Contract terms and conditions must be in writing, and must comply with OAR 137-049-0260(3).

B. A Bidder may submit to the County a written protest of the County's intent to award the Contract within seven (7) days after the County's issuance of the notice of intent to award the Contract. A Bidder may submit a protest of the award only as allowed by, and only in compliance with, OAR 137-049-0450(4).

1.15 SECURITY FOR FAITHFUL PERFORMANCE:

The Successful Bidder shall furnish a Performance Bond and Payment Bond, each in an amount equal to one hundred percent (100%) of the Contract sum, as security for the faithful performance of this Contract and also as security for the payment of all persons performing labor and furnishing materials under this Contract. The Performance and Payment Bonds shall be acceptable to the County, in accordance with State law and shall be delivered to the County not later than the date of execution of the Contract. The Surety signing the Bidder's Bond shall be registered with the Oregon State Insurance Commissioner, and the Surety's name shall appear in the current Authorized Insurance Company list in the State of Oregon published by the office of the Insurance Commissioner. Each Surety's name must also appear on the United States Treasury Department's list of authorized sureties, circular 570, as amended. No Work shall commence at the

project site until approved Bonds are received by the County. Both bonds shall be in compliance with ORS Sections 279C.375, 279C.625 and 701.430.

1.16 TIME FOR COMPLETION:

The time for completion of this Contract shall be as listed in the Bid Form, Specification Section 00 4100 noted as "Milestone Dates List" for Substantial Completion, and as fixed in the Owner-Contractor Agreement.

1.17 LOCATION OF THE WORK:

The site of the proposed work is on County owned property, public streets, easements and/or other right-of-ways, as shown on the drawings.

1.18 LIABILITY INSURANCE AND WORKER'S COMPENSATION:

The Successful Bidder will be required to carry public liability and worker's compensation and other insurance in the amounts and under the terms stipulated under the General Conditions. No Work shall commence at the project site until approved Certificates are received by the County.

1.19 BIDDERS REFERRED TO LAWS:

A. The attention of the Bidders is called to the provisions of all Local, State and Federal laws, regulations, ordinances and resolutions applicable to the work, as well as laws, regulations, ordinances, resolutions and permits relating to obstructing streets, maintaining signals, storing and handling of explosives, preserving safety or affecting the Bidder, or its employees or its work hereunder in its relation to the County or any other person. The Bidder shall obey all such laws, regulations, ordinances, permits or resolutions applicable to the Work or controlling or limiting Contractors while engaged in the execution of the Work under this Contract.

B. The provisions of this Contract shall be interpreted in accordance with the laws of the State of Oregon and in accordance with the laws, ordinances, regulations, permits and resolutions of Baker City and Baker County.

C. The County will not receive or consider a Bid for a Public Improvement Contract unless the Bidder is registered with the Construction Contractors Board, or is licensed by the State Landscape Contractors Board, as specified in OAR 137-049-0230, as applicable.

1.20 TAXES:

Contractor shall include in its Bid and pay for all applicable taxes. Refer to General Conditions regarding further discussion.

1.21 RIGHT TO REJECT BIDS:

The County may reject any Bid not in compliance with all prescribed public contracting procedures and requirements, including the requirement to demonstrate the Bidder's responsibility under ORS 279C.375(3)(b), and may reject for good cause all Bids after finding that doing so is in the public interest. The County reserves the right to cancel the solicitation at any time in its sole discretion and to waive minor informalities and irregularities, in accordance with applicable law, when it deems necessary or advisable, in its sole discretion.

1.22 MODIFICATION OR WITHDRAWAL OF BID:

A. Prior to the time and date designated for receipt of Bids, any Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder, and must be received by the County on or before the date and time set for receipt of Bids, and it shall be so worded as not to reveal the amount of the original Bid.

B. Withdrawn Bids may be resubmitted up to the time designated for the receipt of the Bids provided

that they are then fully in conformance with the Instructions to Bidders.

C. After Bid opening, the County may permit a Bidder to withdraw its Bid, based on one or more clerical errors in the Bid, only if the Bid shows with objective proof and by clear and convincing evidence:
   1. The nature of the error;
   2. That the error is not a minor informality under this subsection or an error in judgment;
   3. That the error cannot be corrected or waived under DJ-AR49-0350;
   4. That the Bidder acted in good faith in submitting a Bid that contained the claimed error and in claiming that the alleged error in the Bid exists;
   5. That the Bidder acted without gross negligence in submitting a Bid that contained a claimed error;
   6. That the Bidder will suffer substantial detriment if the Contracting Agency does not grant the Bidder permission to withdraw the Bid;
   7. That the Contracting Agency's or the public's status has not changed so significantly that relief from the forfeiture will work a substantial hardship on the Contracting Agency or the public it represents; and
   8. That the Bidder promptly gave notice of the claimed error to the Contracting Agency.

D. Bid security, if any is required, shall be in an amount sufficient for the Bid as modified or resubmitted.

E. A decision denying withdrawal of Bid pursuant to Article 21.A herein shall be final and conclusive unless the Bidder appeals the decision within ten (10) days after receipt of the decision.

F. If, upon appeal, it is determined that the decision refusing withdrawal of the Bid was arbitrary or capricious, the sole relief shall be withdrawal of the Bid and return of the Bid security.

1.23 DISCLOSURE AND SUBSTITUTION OF FIRST-TIER SUBCONTRACTORS

A. Within two (2) working hours after the date and time of the deadline when the bids are due to the public contracting agency, for any Public Improvement project exceeding $100,000, all Bidders shall submit to the Agency a disclosure form, included in the Bid Form (Section 00 4100), identifying any first-tier subcontractors (those Entities that would be contracting directly with the prime contractor) that will be furnishing labor and/or materials on the contract, if awarded, whose subcontract value would be equal to or greater than:
   1. Five percent (5%) of the total Contract Price, but at least $15,000;or
   2. $350,000, regardless of the percentage of the total Contract Price.

B. Bidders are required to disclose the following information about each required first-tier subcontractor:
   1. The subcontractor’s name and address,
   2. The category of Work that the subcontractor would be performing,
   3. The subcontractor’s Construction Contractor Board (CCB) registration number, if one is required, and
   4. The subcontract dollar value.

C. The County must reject a bid if the Bidder fails to submit the disclosure form with this information by the stated deadline. (DJ-AR 49-0360) If there are no subcontractors or suppliers required to be disclosed, Bidder must provide the required disclosure form, noting on the completed form “None”. Compliance with the disclosure and submittal requirements of ORS 279C.370 and this rule is a matter of Responsiveness. Bids which are submitted by Bid Closing, but for which the separate disclosure submittal has not been made by the specified deadline, are not Responsive and shall not be considered for Contract Award. A First Tier Subcontractor Disclosure Form which has no subcontractors or suppliers and is completed with the word “None” must be submitted separately and be properly marked in the same manner as any other first-tier subcontractor disclosure form.

D. Substitution of affected first-tier subcontractors shall be made only in accordance with ORS 279C.585.

1.24 DETAILED BID BREAKDOWN:

A. Upon notification from the County to the Bidder that it has submitted the apparent lowest responsive Bid, the Bidder shall, within twenty-four (24) hours, provide a detailed breakdown of its Bid in a form acceptable to the County.

B. The breakdown may be used by the County to verify accounting requirements, and to determine whether the Bidder has grossly misjudged the requirements of any area.

C. The Bidder's failure to provide the requested detailed breakdown in the specified time may result in rejection of the Bid Proposal in the sole discretion of the County.

1.25 AWARD OF CONTRACT:

If the County determines that a contract is to be awarded, it will award the contract to the lowest responsive and responsible Bidder. The "lowest responsible bidder" will be the lowest bidder who has substantially complied with all bidding requirements and procedures and who has not been disqualified by the County under ORS 279C.440. In determining the lowest responsible bidder, the County shall add a percentage increase of the bid of nonresident bidder as required by ORS 279A.120. In the event that all Bids exceed the County's cost estimate, the County may negotiate with the lowest responsive and responsible Bidder in accordance with ORS 279C.340 to solicit value engineering and other options to attempt to bring the contract within the contracting agency's cost estimate.

A. The Lowest Bidder is determined by the aggregate amount of the Base Bid, plus any Alternates selected by the County.

B. A Responsive Bidder shall mean a Bidder who has submitted a Bid which conforms, in all material respects, to the Bidding Documents.

C. A Responsible Bidder shall mean a Bidder who has the capability, in all respects, to perform fully the Contract requirements and the moral and business integrity and reliability which will assure good faith performance. In determining responsibility, the County must determine that the Bidder:

1. Has available the appropriate financial, material, equipment, facility and personnel resources and expertise, or ability to obtain the resources and expertise, necessary to meet all contractual responsibilities;

2. Has completed previous contracts of a similar nature with a satisfactory record of performance. A satisfactory record of performance means that, to the extent the costs associated with and time available to perform a previous contract were within the Bidder's control, the Bidder stayed within the time and budget allotted for the procurement and otherwise performed the contract in a satisfactory manner. A Contracting Agency should carefully scrutinize a Bidder's record of contract performance if the Bidder is or recently has been materially deficient in contract performance. In reviewing the Bidder's performance, the Contracting Agency should determine whether the Bidder's deficient performance was expressly excused under the terms of contract, or whether the Bidder took appropriate corrective action. The Contracting Agency may review the Bidder's performance on both private and Public Contracts in determining the Bidder's record of contract performance. The Contracting Agency shall make its basis for determining that a Bidder is not responsible under this paragraph part of the Solicitation file;

3. Has a satisfactory record of integrity. A Bidder may lack integrity if a Contracting Agency determines the Bidder demonstrates a lack of business ethics such as violation of state environmental laws or false certifications made to a Contracting Agency. A Contracting Agency may find a Bidder not Responsible based on the lack of integrity of any Person having influence or control over the Bidder (such as a key employee of the Bidder that has

the authority to significantly influence the Bidder's performance of the Contract or a parent company, predecessor or successor Person). The standards for Conduct Disqualification under DJ-AR 49-0370 may be used to determine a Bidder's integrity. A Contracting Agency may find a Bidder non-responsible based on previous convictions of offenses related to obtaining or attempting to obtain a contract or subcontract or in connection with the Bidder's performance of a contract or subcontract. The Contracting Agency shall make its basis for determining that a Bidder is not responsible under this paragraph part of the Solicitation file;

4. Is legally qualified to contract with the Contracting Agency; and
5. Has supplied all necessary information in connection with the inquiry concerning responsibility. If the Bidder fails to promptly supply information requested by the Contracting Agency concerning responsibility, the Contracting Agency shall base the determination of responsibility upon any available information, or may find the Bidder not responsible.

D. The ability of the low Bidder to provide the required bonds will not of itself demonstrate responsibility of the Bidder.

E. The County reserves the right to defer award of this Contract for a period of thirty (30) days after the due date of the Bids. During this period of time, the Bidder shall guarantee the prices quoted in its Bid.

1.26 SUBCONTRACTORS:

A. All Subcontractors proposed for the Work must be acceptable to the County.

B. The County reserves the right to request the proposed Subcontractors to complete qualification forms and/or current financial statements prepared by a Certified Public Accountant. These forms will be similar to those required of a Bidder under the Instructions to Bidders.

1.27 MINIMUM WAGE RATES:

Labor required for the construction of this project is subject to the minimum wage rates as provided in the Supplementary General Conditions. No Bid will be received or considered by the County unless the Bid contains a statement by the Bidder as a part of its Bid that "Contractor agrees to be bound by and will comply with the provisions of 279C.838, 279C.840 or 40 U.S.C. 3141 to 3148."

1.28 PRE-BID MEETING (MANDATORY):

A Mandatory Pre-Bid Meeting will be conducted by the County at the time indicated in the Advertisement for Bids to afford Bidders the opportunity to question the County and the Architect. The meeting will be held at the location identified in the Advertisement for Bids. (If no time is given in the Advertisement for Bids, no Pre- Bid Meeting will be held.) Any statements made by the County's representatives at the meeting are not binding upon the County unless confirmed by written addendum.

1.29 MILESTONE DATES AND SCHEDULE:

A. A list of Milestone Dates is included in the Bidding Documents. Each Bidder shall submit the list of Milestone Dates, in its original form, with its bid and, in so doing, will attest that the Bidder intends to complete the Work and other aspects of the Project within the Milestone Dates. The Bidder may not condition its Bid on the acceptance County of delayed Milestone Dates.

B. Within seven (7) calendar days after issuance of Notice to Proceed, the Contractor shall deliver to the County a detailed construction schedule for review and acceptance by the County and shall thereafter be referred to as the Schedule. The Schedule shall be, in form and content, acceptable to the County.

C. The Bidder's attention is drawn to Division 1, Section 01 3200 of the General Requirements entitled "Schedule and Reports" for additional requirements.

1.30 SUBSTITUTIONS:

The attention of potential bidders and other interested parties is called to the conditions set forth in Division 1, Section 01 2500 of General Requirements, "Substitutions", regarding approval and product options for substitutions.

1.31 CONTRACTOR'S DRUG TESTING PROGRAM

Per ORS 279C.505(2), prior to Contract Award, Contractor shall certify to the County that it has a drug testing program in place for its employees that includes, at a minimum, the following:

A. A written employee drug-testing policy.

B. Required drug testing for all new Subject Employees or alternatively, required testing of all Subject Employees every 12 months on a random selection basis,and

C. Required testing of a Subject Employee when the Contractor has reasonable cause to believe the Subject Employee is under the influence of drugs.

1.32 BACKGROUND CHECKS

A. No Unsupervised Contact with Inmates. Unsupervised contact with inmates means contact with inmates that provide the person opportunity and probability for personal communication or touch when not under direct supervision. Contractor will ensure that Contractor, any subcontractors, and their officers, agents and employees will have no direct unsupervised contact with inmates while on County property. Contractor will work with the County to ensure compliance with this requirement. If Contractor is unable to ensure through a security plan that none of its officers, agents or employees will have direct, unsupervised contact with inmates in a particular circumstance or circumstances, Contractor shall so notify the County prior to beginning any Work that could result in such contact. Contractor authorizes County to obtain information about Contractor and Contractor's history and to conduct a criminal background check, including fingerprinting, of any officer, agent or employee of Contractor that will have unsupervised contact with inmates. Contractor also agrees to cause Contractor's employees and/or subcontractors, if any, to authorize County to conduct such background checks. Contractor shall pay all fees assessed by Oregon Department of Corrections and by the County's background check vendor for processing the background check. County may deduct the cost of such fees from a progress of final payment to the Contractor under this contract, unless the Contractor elects to pay such fees directly.

1.33 PERMITS & FEES

The Owner shall coordinate and obtain all permits necessary to obtain the general building permit for the Project. The Owner will pay for the general building permits (including right of way permits, grading and drainage, foundation, mechanical, plumbing and electrical as necessary to initially begin construction), utility connection fees, system development charges and related inspections. The Contractor will be responsible to obtain and pay for all other permits, assessments, penalties, charges, licensing and re-inspection fees required for the proper execution of the Work which are legally required at the time the bids are received or thereafter as a consequence of the Contractor's acts or omissions. The Contractor is responsible for coordinating and obtaining all required inspections and approval signatures. The Contractor is required to submit all inspection records to the County at the completion of the project and as a prerequisite for final payment. Contractor shall not be entitled to any additional time for performance because of its failure to secure or coordinate with the Owner for procurement of any required permits on a timely basis. The contractor will be required to maintain the permit documents at the site as required by the governing authority.

END OF SECTION

SECTION 00 41 00 – BID FORM

Date: July 31, 2025 Time: 2:00 PM

TO:

BAKER COUNTY FACILITIES DEPARTMENT — **OWNER**
1995 3rd STREET, SUITE 60 — **ADDRESS**
BAKER CITY, OR 97814 — **CITY/STATE**

FROM: _____ **BIDDER**

_____ **ADDRESS**

_____ **CITY/STATE**

_____ **TELEPHONE**

_____ **EMAIL ADDRESS**

Operating as (strike out conditions that do not apply) an individual, a Limited Liability Company, a Corporation, organized and existing under the law of the State of _____, or a Proprietorship, a Partnership, or Joint Venture consisting of _____ _____.

BASE BID:

1. Having become completely familiar with the local conditions and legal requirements affecting the cost of Work at the place where Work is to be executed, and having carefully examined the site conditions as they currently exist, and having carefully examined Bidding Documents prepared by COLE Architects titled,

Baker County Emergency Operations Center

together with any addenda to such Bidding Documents as listed hereinafter, the undersigned hereby proposes and agrees to provide all labor, materials, physical plant, equipment, transportation and other facilities and services as necessary and/or required to execute all of the Work described by the aforesaid Bidding Documents for the lump sum consideration:

BASE BID: _____ Dollars ($ _____).

said amount being hereinafter referred to as the Base Bid.

2. If notified of acceptance of this Bid and contract award within thirty (30) calendar days after receipt of bids, the undersigned agrees to deliver all bonds and proof of insurance coverage required by the Specifications and to execute a contract for the above-named project work and the above-stated consideration on the form required, within ten (10) calendar days of such notification.

BID ALTERNATES:

3. Bid Alternates for this project are as follows (reference Specification Section 01 2300 Alternates and Unit Prices for a complete description of all alternates):

A. ALTERNATE #1 – N/A

- ❑ Add to the Base Bid
- ❑ Deduct from the Base Bid

Lump Sum Amount $_____ (_____

_____ and 00/100 dollars.

B. ALTERNATE #2 – N/A

- ❑ Add to the Base Bid
- ❑ Deduct from the Base Bid

Lump Sum Amount $_____ (_____

_____ and 00/100 dollars.

C. ALTERNATE #3 – N/A

- ❑ Add to the Base Bid
- ❑ Deduct from the Base Bid

Lump Sum Amount $_____ (_____

_____ and 00/100 dollars.

UNIT PRICES:

4. Provide unit cost pricing to add or deduct the following items (See Section 01 2300 Alternates and Unit Prices for a complete description of the following Unit Price Items):

UNIT PRICES WILL NOT BE USED FOR THIS CONTRACT

ADDENDA ACKNOWLEDGEMENT:

5. The undersigned acknowledges receipt of the following addenda: (List by number and date appearing on addenda.)

Addendum No.	Date	Addendum No.	Date
_____	_____	_____	_____
_____	_____	_____	_____

TIME OF COMPLETION:

6. The undersigned agrees to substantially complete all Work under this Contract within the dates specified in the milestone date schedule, as set forth in the Owner-Contractor Agreement and this bid form.

CHANGES IN WORK:

7. The undersigned agrees that when changes in Work are ordered which involve extra cost over and above Contract Sum, and when such work, due to an emergency, is ordered to proceed on basis of cost-plus-fee, such shall be as required by the General Conditions and Supplementary Conditions.

BID SECURITY:

8. Bid security in the amount of ten percent (10%) of the Base Bid plus any additive alternates is attached. Failure to submit such security shall result in the Bid being considered non-responsive.

9. The undersigned further agrees to execute the formal Contract within ten (10) days from date of Owner's Notice of Intent to Award, and in case the undersigned fails or neglects to appear within the specified time to execute the Contract, and the undersigned is considered having abandoned the Contract by the Owner, the bid security accompanying this Bid will be forfeited to the Owner by reason of such failure on the part of the undersigned.

10. The undersigned further agrees that the bid security may be retained by the Owner and that said bid security shall remain with the Owner until the Contract has been signed and Performance Bond in a form acceptable to the Owner has been made and delivered to the Owner.

11. The undersigned has checked all of the above figures, and understands that Owner and the Project Manager will not be responsible for any errors or omissions on part of undersigned in preparing this Bid.

12. In submitting this Bid, it is understood by the Bidder that the Bid is a "firm offer," irrevocable, valid and binding, and may not be withdrawn for a period of thirty (30) days from time of opening.

13. The undersigned hereby acknowledges that he has read and understands the Drawings, Specifications, Addenda and all other Contract Documents pertaining to this Project. The undersigned certifies that the Contract Documents are, in his opinion, adequate, feasible and complete for performing the Work and constructing the Work in a sound and suitable manner for the use specified and intended by the Contract Documents. The undersigned further certifies that he has, or has available, the equipment, personnel, materials, facilities and technical and financial ability necessary to complete the Work in accordance with the Contract Documents and within the time specified therein. The Bidder certifies that he has made allowances for normal inclement weather indigenous to the Project site.

14. The following information is provided pursuant to the Contract Documents:

(1) Legal Name of Firm: _____

a. If Firm is a corporation or limited liability company, state of incorporation or organization: _____.

b. If Firm is a partnership, state names of partners:

_____

_____

c. If Firm is an individual using a trade name, state name of individual:

_____

(2) Construction Contractors Board Registration Number: _____

(3) Signature of person or persons legally authorized to bind Bidder to a Contract. A Bid submitted by an agent shall have a current Power of Attorney attached certifying the agent's authority to bind the Bidder.

a. Signature: _____

b. Name (type): _____

c. Title: _____ (Corporate Seal)

d. Address: _____

15. The names and addresses of other persons interested as principals in this Bid are as follows:

_____

_____

_____

16. The undersigned declares that the person or persons signing this Bid is/are fully authorized to sign on behalf of the firm listed and to fully bind the firm listed to all the Bid's conditions and provisions thereof.

17. It is agreed that no person or persons or company other than the firm listed below or as otherwise indicated has any interest whatsoever in this Bid or the Contract that may be entered into as a result of the Bid and that in all respects the Bid is legal and firm, submitted in good faith without collusion or fraud.

18. It is agreed that the undersigned has complied or will comply with all requirements of local, state, and national laws, and that no legal requirement has been or will be violated in making or accepting this Bid, in awarding the Contract to them and/or in the prosecution of the work required.

19. Pursuant to ORS 279A.120, bidder (check one) is /is not a resident bidder. If not, indicate State of residency_____.

20. Contractor agrees to be bound by and will comply with the provisions of 279C.838, 279C.840 or 40 U.S.C. 3141 to 3148.

21. Contractor certifies that it has not discriminated and will not discriminate against minority, women or emerging small business enterprises in obtaining any required subcontracts.

22. The following bank reference is given:

Name of Bank: _____

Address: _____

_____

Bank Officer: _____

Respectfully submitted this_____day of_____, 2025

Firm Name: _____

Address: _____

_____

Signature: _____

Name (type): _____

Title: _____

ENCLOSURES:

- ❑ Bid Form
- ❑ Bid Bond
- ❑ Affidavit of Non-Collusion
- ❑ Acknowledgement of Principal Bidder
- ❑ Milestone Dates List
- ❑ Insurance Binder
- ❑ Statement of Qualifications

FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS: That we,_____as Principal and_____a Corporation duly organized and existing under the laws of the State of_____and legally doing business in the State of Oregon, a surety, are held and firmly bound and obligated unto the Baker County Facilities Department, Baker County, and the State of Oregon, hereinafter called the Owner, in the full and just sum of _____Dollars ($_____), lawful money of the United States of America for the payment of which sum of money well and truly to be made, the said Principal and Surety bind themselves, their and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

Signed, Sealed and Dated this_____day of_____AD, 20_,

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the Owner shall make any award to the Principal for: **Baker County Emergency Operations Center**, according to the terms of the proposal or bid made by the Principal therefore, and the Principal shall duly make and enter into a Contract with the Owner in accordance with the terms of said proposal or bid and award and shall give bond for the faithful performance thereof, with Surety and Sureties approved by the Owner, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect.

IN TESTIMONY WHEREOF, the Principal and Surety have caused these presents to be duly signed and sealed.

_____

Principal:

_____

By:

_____

Surety:

_____

By Attorney-in-Fact:

AFFIDAVIT OF NON-COLLUSION

State of Oregon)
) ss
County of)

being duly sworn, deposes and says, that he is the identical person who submitted the foregoing proposal or bid, and that such bid is genuine and not sham or collusive or made in the interest or on behalf of any person not thereon named, and further, that the deponent has not directly or indirectly induced or solicited any other bidder on the foregoing work or equipment to put in a sham bid, or any other person or corporation to refrain from bidding, and that deponent has not, in any manner, sought by collusion to secure himself, or to any other person, an advantage over any other Bidder or Bidders.

Sign Here:

_____

(Company Name)

_____

(Signature)

_____

(Title)

Subscribed and sworn to before me this_____day of_____, 2025.

_____

Notary Public in and for the State of Oregon, residing at:

_____

_____

(This Affidavit properly executed must accompany all bids.

(ACKNOWLEDGEMENT OF PRINCIPAL OF BIDDER, IF A CORPORATION)

State of_____)
) ss:
County of_____)

On this_____day of_____, 2025 before me personally came and appeared _____ to me known, who being by me duly sworn, did depose and say that he resides at _____

that he is the_____of _____ the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the impressions affixed to said instrument is an impression of such seal; that it was so affixed by order of the directors of said corporation; and that he signed his name thereto by like order.

_____

(SEAL)
My Commission Expires _____

(ACKNOWLEDGEMENT OF PRINCIPAL OF BIDDER, IF A LIMITED LIABILITY COMPANY)

State of_____)
) ss:
County of_____)

On this_____day of_____, 2025 before me personally came and appeared, to me known, and known to me to be one of the members/managers of the firm of_____ described in and who executed the foregoing instrument, and he acknowledged to me that he executed the same as and for the act and deed of said firm.

_____

(SEAL)
My Commission Expires _____

(ACKNOWLEDGEMENT OF PRINCIPAL OF BIDDER, IF A PARTNERSHIP)

State of_____)
) ss:
County of_____)

On this_____day of_____, 2025 before me personally came and appeared, to me known, and known to me to be one of the partners of the firm of_____described in and who executed the foregoing instrument, and he acknowledged to me that he executed the same as and for the act and deed of said firm.

_____

(SEAL)
My Commission Expires _____

(ACKNOWLEDGEMENT OF PRINCIPAL OF BIDDER, IF A SOLE PROPRIETORSHIP)

State of_____)
) ss:
County of_____)

On this_____day of_____, 2025 before me personally came and appeared, to me known, and known to me to be one of the members of the firm of_____
_____,
described in and who executed the foregoing instrument, and he acknowledged to me that he executed the same as and for the act and deed of said firm.

_____

(SEAL)
My Commission Expires _____

MILESTONE DATES LIST

Substantial Completion	**Friday, May 29, 2026**
Final Completion	**Friday, June 29, 2026**

STATEMENT OF QUALIFICATIONS (Page One)

This Statement of Qualification form shall be submitted with the bid.

Submitted By (Firm/Company): _____

Address: _____

1. Date Firm First Organized _____
2. Financial Status:

What is bonding capacity? $ _____

Credit available for this Contract? $ _____

Gross amount of Contracts now in hand? $ _____

Current value of assets? $ _____

Has Contractor (or Contractor's responsible managing individual) ever declared bankruptcy? If so, when and where?

_____

3. List projects similar to the requirements of this project for which Contractor had a contract in the $2,000,000 - $3,000,000 range during the past three (3) years. Start with current or most recent projects:

Project Name	Owner (Phone #)	Contract Amount	Project Status (Dates)

STATEMENT OF QUALIFICATIONS (Page Two)

4. Who will be the Project Manager? _____

Who will be the Project Superintendent? _____

List experience relevant and similar to the requirements of this project for which this individual has been Project Superintendent:

Project Name	Owner (Phone #)	Contract Amount	Project Status (Dates)

5. Please state the work Contractor normally performs with Contractor's own forces.

_____

_____

_____

6. Please list any litigation or arbitration between firm and any Owner in the last three years.

_____

_____

_____

_____

I certify that the foregoing statement is true to the best of my information and belief. I understand the Owner is relying upon this statement in their determination as to whether Contractor is a responsible bidder.

_____ _____

(Date) (Signature and Title of Officer)

1st TIER SUBCONTRACTOR DISCLOSURE INSTRUCTIONS AND FORM

(1) Pursuant to ORS 279C.370 Bidders are required to disclose information about certain first-tier subcontractors when the County estimates the Contract value for a Public Improvement to be greater than $100,000. Specifically, when the Contract amount of a first-tier subcontractor furnishing labor, or labor and materials, would be greater than or equal to: (i) 5% of the project Bid, but at least $15,000, or (ii) $350,000 regardless of the percentage, the Bidder must disclose the following information about that subcontract in its Bid submission or within two (2) working hours after Closing:

(a) The subcontractor's name,
(b) Dollar value and,
(c) The category of work that the subcontractor would be performing.

If the Bidder will not be using any subcontractors that are subject to the above disclosure requirements, the Bidder is required to indicate "NONE" on the Disclosure Form. The County must reject a bid if the bidder fails to submit the disclosure form with this information by the stated deadline.

(2) A Bidder shall submit the disclosure form required by ORS 279C.370 either in its Bid submission or within two (2) working hours after Closing. Compliance with the disclosure and submittal requirements is a matter of responsiveness. Bids which are submitted by Closing, but for which the disclosure submittal has not been made by the specified deadline, are not responsive and shall not be considered for Contract award.

(3) The County shall obtain, and make available for public inspection, the disclosure forms required by ORS 279C.370. The County shall also provide copies of disclosure forms to the Bureau of Labor and Industries as required by ORS 279C.835. The County is not required to determine the accuracy or completeness of the information submitted. Substitution of affected first-tier subcontractors shall be made only in accordance with ORS 279C.585.

FIRST TIER SUBCONTRACTOR DISCLOSURE FORM

PROJECT: Baker County Emergency Operations Center
BID CLOSING: July 31, 2025 at 2:00 PM PST

This form must be submitted at the location specified in the Invitation to Bid on the advertised bid closing date and within two working hours after the advertised bid closing time.

List below the name of each subcontractor that will be furnishing labor or will be furnishing labor and materials and that is required to be disclosed, the category of work that the subcontractor will be performing and the dollar value of the subcontract. Enter "NONE" if there are no subcontractors that need to be disclosed. (ATTACH ADDITIONAL SHEETS IF NEEDED.)

SPEC SECTION	NAME	ADDRESS	CCB #	CONTRACT AMOUNT

END OF SECTION

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

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

Baker County
1995 3rd Street, Suite 60
Baker City, OR 97814
(541) 523-6416

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

Contractor Name
Contractor Address
Contractor Phone Number

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

23-105-OR Baker County Emergency Operations Center
3410 K Street
Baker City, OR 97814

Baker County Emergency Operations Center is an addition to the existing Baker County Sheriff's building in Baker City Oregon. The addition will provide a new workspace for the 911 dispatch responders, a large flexible area for emergency response staff across many regional services to co-office and work together in emergency situations, as well as restrooms, secure entry, and support spaces for communication and infrastructure. The building's exterior walls willbe constructed using ICF (insulated concrete formwork), with steel roof joists, exterior roof deck insulation, and a low-slope membrane roof. Interior walls will be cold-formed steel construction, with cost-effective finishes throughout.

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

Cole Architects, PLLC
1000 NW Bond Street, Ste 205
Bend, OR 97703
(541) 383-1898

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.

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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: May 29, 2026

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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
None	

§ 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
None		

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
None	

§ 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)
None		

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

None

§ 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

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month, or as follows:

The 28th day of each month.

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the Twenty-Eighth day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the Fifteenth day of the following 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 Thirty (30) 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%

§ 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.)

None

§ 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

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for such modifications.)

None

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

None

§ 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.)

1.50 % monthly

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.)

[X] 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.

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ARTICLE 7 TERMINATION OR SUSPENSION

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

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

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

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

Dan McQuisten

Baker County Facilities Department

1995 3rd Street, Suite 60, Baker County, OR 97814
(541) 423-6414
dmcquisten@bakercounty.or.gov

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

Contractor Representative's Name
Contractor Representative's Address
Contractor Representative's Telephone Number
Contractor Representative's Mobile Number
Contractor Representative's Email Address

§ 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:

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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

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

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

[ ]

[ ]

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
Section 00 73 00	Supplemental General Conditions		6

.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.

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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

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Changes to original AIA text

PAGE 3

Item	Price
None	

Item	Price	Conditions for Acceptance
None		

Item	Price
None	

Item	Units and Limitations	Price per Unit ($0.00)
None		

PAGE 7

.4 ~~Building information modeling exhibit, dated as indicated below:~~
~~*(Insert the date of the building information modeling exhibit incorporated into this Agreement.)*~~

[ ] ~~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:~~

Document	Title	Date	Pages
Section 00 73 00	Supplemental General Conditions		6

Variable Information

PAGE 1

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

Baker County

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1995 3rd Street, Suite 60

Baker City, OR 97814

(541) 523-6416

Contractor Name

Contractor Address

Contractor Phone Number

23-105-OR Baker County Emergency Operations Center

3410 K Street
Baker City, OR 97814

Baker County Emergency Operations Center is an addition to the existing Baker County Sheriff's building in Baker City Oregon. The addition will provide a new workspace for the 911 dispatch responders, a large flexible area for emergency response staff across many regional services to co-office and work together in emergency situations, as well as restrooms, secure entry, and support spaces for communication and infrastructure. The building's exterior walls willbe constructed using ICF (insulated concrete formwork), with steel roof joists, exterior roof deck insulation, and a low-slope membrane roof. Interior walls will be cold-formed steel construction, with cost-effective finishes throughout.

Cole Architects, PLLC

1000 NW Bond Street, Ste 205

Bend, OR 97703

(541) 383-1898

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.

[X] By the following date: May 29, 2026

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.

None

PAGE 4

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The 28th day of each month.

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the Twenty-Eighth day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the Fifteenth day of the following 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 Thirty (30) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

5%

None

PAGE 5

None

None

1.50 % monthly

[X] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

PAGE 6

Dan McQuisten

Baker County Facilities Department

1995 3rd Street, Suite 60, Baker County, OR 97814

(541) 423-6414

dmcquisten@bakercounty.or.gov

Contractor Representative's Name

Contractor Representative's Address

Contractor Representative's Telephone Number

Contractor Representative's Mobile Number

Contractor Representative's Email Address

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AIA® Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the Ninth day of July in the year Two Thousand Twenty-Five
(In words, indicate day, month and year.)

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

23-105-OR Baker County Emergency Operations Center
3410 K Street
Baker City, OR 97814

THE OWNER:
(Name, legal status and address)

Baker County Facilities Department
1995 3rd Street, Ste 60
Baker City, OR 97814

THE CONTRACTOR:
(Name, legal status and address)

Contractor Name
Contractor Address

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

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

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

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

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§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit
N/A	

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit
N/A	

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

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[ ] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

[ ] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.
The Owner shall purchase and maintain the insurance selected below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[ ] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information.
(Indicate applicable limits of coverage or other conditions in the fill point below.)

[ ] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	**Limits**
N/A	

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS
§ A.3.1 General
§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request.

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An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage 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 for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than Two Million Dollars and Zero Cents ($ 2,000,000.00) each occurrence, Four Million Dollars and Zero Cents ($ 4,000,000.00) general aggregate, and Four Million Dollars and Zero Cents ($ 4,000,000.00) aggregate for products-completed operations hazard, providing coverage for claims including

- **.1** damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- **.2** personal injury and advertising injury;
- **.3** damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- **.4** bodily injury or property damage arising out of completed operations; and
- **.5** the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- **.1** Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- **.2** Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- **.3** Claims for bodily injury other than to employees of the insured.
- **.4** Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- **.5** Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- **.6** Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- **.7** Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- **.8** Claims related to roofing, if the Work involves roofing.
- **.9** Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- **.10** Claims related to earth subsidence or movement, where the Work involves such hazards.

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.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Million Dollars and Zero Cents ($ 1,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than One Million Dollars and Zero Cents ($ 1,000,000.00) each accident, One Million Dollars and Zero Cents ($ 1,000,000.00) each employee, and One Million Dollars and Zero Cents ($ 1,000,000.00) policy limit.

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

X] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11

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of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

[XX] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[X X] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[ ] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	**Limits**

§ A.3.4 Performance Bond and Payment Bond
The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	**Penal Sum ($0.00)**
Payment Bond	TBD
Performance Bond	TBD

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS
Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

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

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.

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Changes to original AIA text

PAGE 2

Causes of Loss	**Sub-Limit**
N/A	

Coverage	**Sub-Limit**
N/A	

PAGE 3

Coverage	**Limits**
N/A	

PAGE 5

~~**§ A.3.2.7** Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks~~

~~**§ A.3.2.11** Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.~~

~~**§ A.3.2.12** Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.~~

[X] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

PAGE 6

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[ ] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for Work within fifty (50) feet of railroad property.

[ ] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[XX] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[X X] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

Type	**Penal Sum ($0.00)**
Payment Bond	TBD
Performance Bond	TBD

Variable Information

PAGE 1

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the Ninth day of July in the year Two Thousand Twenty-Five
(In words, indicate day, month and year.)

23-105-OR Baker County Emergency Operations Center

3410 K Street
Baker City, OR 97814

Baker County Facilities Department

1995 3rd Street, Ste 60
Baker City, OR 97814

Contractor Name

Contractor Address

PAGE 4

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than Two Million Dollars and Zero Cents ($ 2,000,000.00) each occurrence, Four Million Dollars and Zero Cents ($ 4,000,000.00) general aggregate, and Four Million Dollars and Zero Cents ($ 4,000,000.00) aggregate for products-completed operations hazard, providing coverage for claims including

PAGE 5

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Million Dollars and Zero Cents ($ 1,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.6 Employers' Liability with policy limits not less than One Million Dollars and Zero Cents ($ 1,000,000.00) each accident, One Million Dollars and Zero Cents ($ 1,000,000.00) each employee, and One Million Dollars and Zero Cents ($ 1,000,000.00) policy limit.

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[XX] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[X X] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

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SECTION 00 61 13 – PERFORMANCE BOND

Bond No. _____

Amount: $ _____

KNOW ALL MEN BY THESE PRESENTS that, we , as Principal (Contractor), and_____, a corporation organized and existing under the laws of the State of Oregon_____, and duly authorized to transact a SURETY business in the State of Oregon, as SURETY, are held and firmly bound unto BAKER COUNTY FACILITIES DEPARTMENT, BAKER COUNTY, OREGON, in the sum of_____DOLLARS, ($_____), lawful money of the United State of America, for the payment whereof well and truly to be made, we and each of use, jointly and severally, bind ourselves, our and each of our heirs, executors, administrators, successors and assigns firmly by these presents.

THE CONDITIONS of this obligation are such that, whereas the above Principal did on the_____day of _____, 2025 enter into a Contract with Baker County Facilities Department, Baker County, Oregon for the construction required for the Baker County Emergency Operations Center, which Contract is made a part hereof as if fully copied herein;

NOW, THEREFORE, if the said Principal faithfully, punctually and completely performs and abides by all covenants and conditions of said Contract, and with all laws, ordinances, regulations, and orders of the State of Oregon, and Baker County, and the agencies and bureaus thereof, directly or indirectly governing or applicable to the Principal's performance under the said Contract, including but not limited to the requirements of Oregon Revised Statutes Chapter 279A and 279C relating to public contracts, which hereby is made a part hereof as if fully copied herein, and shall make payment promptly, as due to Baker County Facilities Department, Baker County, Oregon and to all other public entities as may be required, and to all subcontractors and to all persons supplying to the Principal or his (its) subcontractors' equipment, supplies, labor, or materials for the prosecution of the work or any part thereof, provided for in said Contract, then this obligation shall be null and void, otherwise to be in full force and effect.

Surety agrees (1) that any extension of time allowed said Principal for completion of work or for delivery under the said Contract shall not impair this obligation or reduce any period of maintenance or warranty provided in said Contract; (2) that any change made in the terms or provisions of said Contract increasing the price to be paid to Principal, without notice to the SURETY shall not impair this obligation, but any such change shall automatically increase the obligation of the SURETY hereunder in a like amount, PROVIDED that such increase shall not exceed twenty-five percent (25%) of the original amount of this obligation without consent of the SURETY; and (3) that this obligation shall continue to bind the said Principal and SURETY notwithstanding successive payments made hereunder for successive breaches, until the full amount of the said obligation is exhausted.

IN WITNESS WHEREOF, the Principal and Surety have caused these presents to be executed on this day of _____, 2025.

_____

Principal

By:_____

Title_____

_____

Surety

By:_____
Attorney in Fact

COUNTERSIGNED:

_____

Oregon Resident Agent

_____

Address

_____

N O T E

If Principal is operating under an assumed business name, there must also be set forth in the first paragraph of the bond, the names of all the partners or the individuals owning the business, and the bond must be executed by one of them.

If the Principal is a corporation, the bond must be executed by one of the officers authorized to execute bonds, showing his official title and the seal of the corporation.

The bond must be executed by an attorney-in-fact for the surety company, showing on the face thereof the Oregon agent for service, and bear the seal of the surety company. Where the bond is executed by a person outside the state of Oregon, his authority to execute bonds should be shown.

The bond must be furnished by a surety company authorized to do business in Oregon, and in an amount equal to the full contract price.

END OF SECTION

SECTION 00 62 40 – OUT OF STATE

In accordance with ORS 279A.120:

1. The County shall prefer goods or services that have been manufactured or produced in this state if price, fitness, availability and quality are otherwise equal.
2. The County shall add a percent increase to the bid of a nonresident bidder equal to the percent, if any, of the preference given to the bidder in the state in which the bidder resides.
3. When a public contract is awarded to a nonresident bidder and the contract price exceeds $10,000, the bidder shall promptly report to the Department of Revenue, on forms to be provided by the Department, the total contract price, terms of payment, length of contract and such other information as the Department may require before the bidder may receive final payment on the contract. The County shall satisfy itself that the requirement of this subsection has been complied with before the County issues final payment on a public contract.
4. For purposes of this subsection, a “nonresident bidder” means a bidder who is not a resident bidder. “Resident bidder” means a bidder that has paid unemployment taxes or income taxes in Oregon during the 12 calendar months immediately preceding submission of the bid, has a business address in Oregon, and has stated in its bid whether the bidder is a “resident bidder” under ORS 279A.120.

END OF SECTION

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

23-105-OR Baker County Emergency Operations Center
3410 K Street
Baker City, OR 97814

THE OWNER:
(Name, legal status and address)

Baker County
1995 3rd Street, Suite 60
Baker City, OR 97814

THE ARCHITECT:
(Name, legal status and address)

Cole Architects, PLLC
1000 NW Bond Street, Ste 205
Bend, OR 97703

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.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™–2017, Guide for Supplementary Conditions.

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, 13.3.2, 14.1, 15.1.2, 15.2
Addenda
1.1.1
Additional Costs, Claims for
3.7.4, 3.7.5, 10.3.2, 15.1.5
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.4**
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**
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
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10
Approvals
2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1
Arbitration
8.3.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 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, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 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, 9.5.4, 9.6.4, 15.1.4, 15.2
Architect's Additional Services and Expenses
2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.5, 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, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2
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, 2.3.3, 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, 4.2, 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, 12, 13.3.2, 13.4, 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
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, 13.4
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.6.8, 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
Binding Dispute Resolution
8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1
Bonds, Lien
7.3.4.4, 9.6.8, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**
Building Information Models Use and Reliance
1.8
Building Permit
3.7.1
Capitalization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
Certificates for Payment
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, 15.1.4
Certificates of Inspection, Testing or Approval
13.4.4
Certificates of Insurance
9.10.2
Change Orders

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1.1.1, 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, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
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, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
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, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
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, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 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, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 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, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 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, 3.11, 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, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **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
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5, 15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor's Construction and Submittal Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 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, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 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,

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10.3, 11.3, 12, 13.4, 15.1.3, 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
2.2.2, 9.7
Contractor's Right to Terminate the Contract
14.1
Contractor's Submittals
3.10, 3.11, 3.12, 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
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, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
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, 2.3.6, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 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, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 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, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 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, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
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, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 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
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 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, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
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, **15.1.6**, 15.2.5
Digital Data Use and Transmission
1.7
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
Emergencies
10.4, 14.1.1.2, **15.1.5**
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, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
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, 7.3.4, 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, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4
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, 15.1.6, **15.2.5**
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 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**, 12.3, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials and Substances
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3
Information and Services Required of the Owner

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2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 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, 13.4
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, 13.4.2
Instruments of Service, Definition of
1.1.7
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**
Insurance, Notice of Cancellation or Expiration
11.1.4, 11.2.3
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 14.4.2
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, 11.2, 11.4, 11.5
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Insured loss, Adjustment and Settlement of
11.5
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13
Interest
13.5
Interpretation
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12
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, 5.2.1, 6.2.1, 7.3.4, 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, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 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, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 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, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Mediation
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1
Minor Changes in the Work
1.1.1, 3.4.2, 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, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2
Notice
1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1
Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3
Notice of Claims
1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's

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3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 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, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 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, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
Owner's 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
2.5, 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
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**
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, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
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
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 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, 15.1.4
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.2**
Proposal Requirements
1.1.1
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 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

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3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 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, 12.2.1, 12.2.2, 12.2.4, **13.3**, 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, 15.1.6.2
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
Separate Contractors, Definition of
6.1.1
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, 9.9.2, 9.4.2, 9.10.1, 13.4
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, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 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, 3.18, 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, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
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, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
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, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2,** 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

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TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and 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, 10.3.2, 12.2.1, **13.4**
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, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 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, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work
9.3.2, 9.3.3
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, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 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
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2
Weather Delays
8.3, 15.1.6.2
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, 9.10.3, 13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

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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 or proposal requirements.

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the

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purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

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§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

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but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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

§ 3.11 Documents and Samples at the Site

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

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constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the

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Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

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§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

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

- **.1** Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- **.2** Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

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.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

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

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

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§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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whom the Contractor intends to pay.

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

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

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or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

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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' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

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§ 9.10 Final Completion and Final Payment

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

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

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

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

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

- **.1** employees on the Work and other persons who may be affected thereby;

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.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed

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by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

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

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

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

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the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

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

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

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fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

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approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

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Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

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

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

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

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner

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may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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similar procedural rules and methods for selecting arbitrator(s).

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

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

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Additions and Deletions Report for
AIA® Document A201® – 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.

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Changes to original AIA text

There are no edits to the original text

Variable Information

PAGE 1

23-105-OR Baker County Emergency Operations Center

3410 K Street
Baker City, OR 97814

Baker County

1995 3rd Street, Suite 60
Baker City, OR 97814

Cole Architects, PLLC

1000 NW Bond Street, Ste 205
Bend, OR 97703

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 21:35:52 PDT on 07/09/2025 under Order No. 20240072097 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ - 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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User Notes: (6866d218e82c936e453e48ae)

SECTION 00 73 00 – SUPPLEMENTAL GENERAL CONDITIONS

REFERENCE:

"GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION," consist of the General Conditions of the Contract (Section 00 70 00) and are further revised and supplemented by the provisions of these Supplementary General Conditions of the Contract, hereinafter called the "Supplementary General Conditions." The General Conditions and the Supplementary General Conditions are applicable to all of the Work under this Contract and shall apply to the Contractor, and to all Subcontractors and Sub-subcontractors.

SUPPLEMENTS:

The following supplements modify, change, delete, or add to the General Conditions.

1. Contractor shall make payment promptly, as due, to all persons supplying tosuch contractor labor or material for the prosecution of the work provided for in the contract, and shall be responsible for payment to such persons supplying labor or material to any subcontractor. ORS 279C.505
2. Contractor shall pay promptly all contributions or amounts due to the State Accident Insurance Fund (SAIF) and the State Unemployment Compensation Fund from contractor or any subcontractor in connection with the performance of the contract. ORS 279C.505
3. Contractor shall not permit any lien or claim to be filed or prosecuted against the County on account of any labor or material furnished, shall assume responsibility for satisfaction of any lien so filed or prosecuted and shall defend against, indemnify and hold County harmless form any such lien or claim. ORS 279C.505
4. Contractor and any subcontractor shall pay to the Department of Revenue allsums withheld from employees pursuant to ORS 316.167. ORS 279C.505
5. For Public Improvement Contracts and construction contracts only, if contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to the contractor or a subcontractor by any person in connection with the public contract as such claim becomes due, the County may pay such claim to the person furnishing the labor or contractor by reason of the contract. The payment of a claim in a manner authorized here shall not relieve the contractor or its surety from the obligation with respect to any unpaid claim. If the County is unable to determine the validity of any claim for labor or services furnished, the County may withhold from any current payment due Contractor an amount equal to said claim until its validity is determined, and the claim, if valid is paid by the contractor or the County. There shall be no final acceptance of the work under the contract until all such claims have been resolved. ORS 279C.515
6. Contractor shall make payment promptly, as due, to any person, co-partnership, association or corporation furnishing medical, surgical, hospital or other needed care and attention, incident to sickness or injury, to the employees of contractor, of allsums which the contractor agreed to pay or collected or deducted from the wages of employees pursuant to any law, contract or agreement for the purpose of providing payment for such service. 279B.230, 279C.530
7. For Public Improvement Contracts, the Contractor shall demonstrate that anemployee drug testing program is in place. ORS 279C.505

8. With certain exceptions listed below, contractor shall not require or permit any person to work more than 10 hours in any one day, or 40 hours in any one week except in case of necessity, emergency, or where public policy absolutely requires it, and in such cases the person shall be paid at least time and a half for:
    a. All overtime in excess of eight hours a day or 40 hours in any one week when the work week is five consecutive days Monday through Friday, or
    b. All overtime in excess of 10 hours a day or 40 hours in any one week when the work week is four consecutive days, Monday through Thursday, and
    c. All work performed on the day specified in ORS 279B.020 (1) for non-public improvement contracts or ORS 279C.540 (1) for public improvement contracts.

    For personal service contracts as designated under ORS 279A.055, instead of (a) and (b) above, a laborer shall be paid at least time and a half for all overtime worked in excess of 40 hours in any one week, except for individuals under these contracts who are excluded under ORS 653.010 or 653.261 or under 29 USC Sections 201 to 209, from receiving overtime.

    Contractor shall follow all other exceptions pursuant to ORS 279B.235 (for non-public improvement contracts) and ORS 2791C.540 (for non- public improvement contracts) including contracts involving collective bargaining agreements, contracts for services and contracts for fire prevention and suppression. This paragraph does not apply to contracts for purchase of goods or personal property.

    Contractor must give notice to employees who work on a public contract in writing, either at the time of hire or before commencement of work on the contract, or by posting a notice in a location frequented by employees, of the number of hours per day and days per week that the employees may be required to work.
9. For Public Works projects subject to ORS 279C.800 to 279C.870 and the Davis-Bacon Act (40 U.S.C. 276a): (1) If the state prevailing rate of wage is higher than the federal prevailing rate of wage, the contractor and every subcontractor on the project shall pay at least the state prevailing rate of wage as required by ORS 279C.800 to 279C.870; and (2) If the federal prevailing rate of wage is higher than the state prevailing rate of wage, the contractor and every subcontractor on the project shall pay at least the federal prevailing rate of wage as required by the Davis-Bacon Act. ORS 279C.840
10. As to public improvement and construction contracts, Contractor shall comply with all applicable federal, state and local laws and regulations, including but not limited to those dealing with the prevention of environmental pollution and the preservation of natural resources that affect the performance of the contract. Entitles which have enacted such laws or regulations include the following: **Federal**: Department of Agriculture, Forest Service, Soil Conservation Service, Army Corps of Engineers, Department of Energy, Federal Energy Regulatory Commission, Environmental Protection Agency, Department of Health and Human Services, Department of Housing and Urban Development, Solar Energy and Energy Conservation Bank, Department of Interior, Bureau of Land Management, Bureau of Indian Affairs, Bureau of Mines, Bureau of Reclamation, Geological Survey, Minerals Management Service, U.S. Fish and Wildlife Service, Department of Labor, Mine Safety

and Health Administration, Occupational Safety and Health Administration, Department of Transportation, Coast Guard, Federal Highway Administration, Water Resources Council, and Department of Homeland Security. **State**: Department of Administrative Services, Department of Agriculture, Department of Consumer and Business Services, Oregon Occupational Safety and Health Division, Department of Energy, Department of Environmental Quality, Department of Fish and Wildlife, Department of Forestry, Department of Geology and Mineral Industries, Department of Human Resources, Department of Land Conservation and Development, Department of Parks and Recreation, Soil and Water Conservation Commission, State Engineer, Department of Transportation, State Land Board, Water Resources Department. **Local**: City Councils, County Boards of Commissioners, County Service Districts, Sanitary Districts, Water Districts, Fire Protection Districts, Weed Districts and Planning Commissions.

If new or amended statutes, ordinances or regulations are adopted or the Contractor encounters a condition not referred to in the bid document not caused by the contractor and not discoverable by reasonable site inspection, which requires compliance with federal, state or local laws or regulations dealing with the prevention of environmental pollution or the preservation of natural resources, both the County and the Contractor shall have all the rights and obligations specified in ORS 279C.525. ORS 279C.525

11. The contract may be canceled at the election of County for any substantial breach, willful failure or refusal on the part of contractor to faithfully perform the contract according to its terms. The County may terminate the contract by written order or upon request of the contractor, if the work cannot be completed for reasons beyond the control of either the contractor or the County, or for any reason considered to be in the public interest other than a labor dispute, or by reason of any third party judicial proceeding relating to the work other than one filed in regards to a labor dispute, and when circumstances or conditions are such that it is impracticable within a reasonable time to proceed with a substantial portion of the work. In either case, for public improvement contracts, if the work is suspended but the contract not terminated, the contractor is entitled to a reasonable time extension, costs, and overhead per ORS 297C.655. Unless otherwise stated in the contract, if the contract is terminated, the contractor shall be paid per ORS 279C.660 for a public improvement contract. ORS 279C.655, ORS 279C.660 and ORS 279C.665
12. If the County does not appropriate funds for the next succeeding fiscal year to continue payments otherwise required by the contract, the contract will terminate at the end of the last fiscal year for which payments have been appropriated. The County will notify the contractor of such non-appropriation not later than 30 days before the beginning of the year within which funds are not appropriated. Upon termination pursuant to this subsection, the County shall have no further obligation to the contractor for payments beyond the termination date. This provision does not permit the County to terminate the contact in order to provide similar services or goods from a different contractor.
    ORS 294.100
13. By execution of the contract, contractor certifies, under penalty of perjury that:
    a. To the best of contractor's knowledge, contractor is not in violation of any tax laws described in ORS 305.380(4), and
    b. Contractor has not discriminated against minority, women or small business enterprises in obtaining any required subcontracts.

c. Contractor prepared its bid or proposal related to this Agreement independently from all other bidders or proposers, and without collusion, fraud or other dishonesty.

14. Contractor agrees to prefer goods or services that have been manufactured or produced in this State if price, fitness, availability or quality are otherwise equal. ORS 279A.120, ORS 279A.128
15. Contractor agrees not to assign the contract or any payments due under the contract without the proposed assignee being first approved and accepted in writing by the County. ORS 294.100
16. Contractor agrees to make all provisions of the contract with the County applicable to any subcontractor performing work under the contract.
17. The County will not be responsible for any losses or unanticipated costs suffered by contractor as a result of the contractor's failure to obtain full information in advance in regard to all conditions pertaining to the work.
18. All modifications and amendments to the contract shall be effective only if in writing and executed by both parties.
19. The contractor certifies he or she has all necessary licenses, permits, or certificates of registration (including Construction Contractor Board registration or Landscape Contractor Board license, if applicable), necessary to perform the contract and further certifies that all subcontractors shall likewise have all necessary licenses, permits or certificates before performing any work. The failure of contractor to have or maintain such licenses, permits or certificates is grounds for rejection of a bid or immediate termination of the contract.
20. Unless otherwise provided, data which originates from the contract shall be "works for hire" as defined by the U.S. Copyright Act of 1976 and shall be owned by the County. Data shall include, but not be limited to, reports, documents, pamphlets, advertisements, books, magazines, surveys, studies, computer programs, films, tapes, and/or sound reproductions. Ownership includes the right to copyright, patent, register and the ability to transfer these rights. Data which is delivered under the contract, but which does not originate therefrom shall be transferred to the County with a nonexclusive, royalty-free, irrevocable license to publish, translate, reproduce, deliver, perform, dispose of, and to authorize others to do so; provided that such license shall be limited to the extent which the contractor has a right to grant such a license. The contractor shall exert all reasonable effort to advise the County, at the time of delivery of data furnished under the contract, of all known or potential invasions of privacy contained therein and of any portion of such document which was not produced in the performance of the contract. The County shall receive prompt written notice of each notice or claim of copyright infringement received by the contractor with respect to any data delivered under the contract. The County shall have the right to modify or remove any restrictive markings placed upon the data by the contractor.
21. If as a result of the contract, the contractor produces a report, paper publication, brochure, pamphlet or other document on paper which uses more than a total 500 pages of 8 ½" by 11" paper, the contractor shall use recycled paper with at least 25% post-consumer content which meets printing specifications and availability requirements. In all other cases Contractor shall make reasonable efforts to use recycled materials in the performance of work required under the contract. ORS 279A.125
22. As to contracts for lawn and landscape maintenance, the contractor shall salvage, recycle, compost or mulch yard waste material in an approved, site, if feasible and cost- effective.
23. When a public contract is awarded to a nonresident bidder and the contract price exceeds $10,000,

the contractor shall promptly report to the Department of Revenue on forms to be provided by the department the total contract, price, terms of payment, length of contract and such other information as the department may require before the County will make final payment on the contract. ORS 279A.120

24. In the event an action, lawsuit or proceeding, including appeal therefrom, is brought for violation of or to interpret any of the terms of the contract, each party shall be responsible for their own attorney fees, expenses, costs and disbursements for said action, lawsuit, proceeding or appeal.
25. Contractor is not carrying out a function on behalf of County, and County does not have the right of direction or control of the manner in which Contractor delivers services under the Contract or exercise any control over the activities of Contractor. Contractor is not an officer, employee or agent of County as those terms are used in ORS 30.265. Contractor covenants for itself and its successors in interest and assigns that it will not claim or assert that Contractor is an officer, employee or agent of the County, as those terms are used in ORS 30.265.
26. Contractor shall adhere to and enforce a zero tolerance policy for the use of alcohol and the unlawful selling, possession or use of drugs while performing work under the Contract.
27. The Contract is expressly subject to the debt limitation of Oregon counties set forth in Article XI, Section 10, of the Oregon Constitution, and is contingent upon funds being appropriated therefore. Any provisions herein, which would conflict with law, are deemed inoperative to that extent.
28. Contractor shall comply with all federal, state and local laws, regulations, executive orders and ordinances applicable to the Contract. Without limiting the generality of the foregoing, Contractor expressly agrees to comply with the following laws, regulations and executive orders:
    a. Titles VI and VII of the Civil Rights Act of 1964, as amended;
    b. Sections 503 and 504 of the Rehabilitation Act of 1973, as amended;
    c. the Americans with Disabilities Act of 1990, as amended and ORS 659A.112 through 659A.139;
    d. Executive Order 11246, as amended;
    e. the Health Insurance Portability and Accountability Act of 1996;
    f. the Age Discrimination in Employment Act of 1967, as amended, and the Age Discrimination Act of 1975, as amended;
    g. the Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended;
    h. ORS Chapter 659A, as amended;
    i. all regulations and administrative rules established pursuant to the foregoing laws; and
    j. all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations.

    The above listed laws, regulations and executive orders and all regulations and administrative rules established pursuant to those laws are incorporated by reference herein to the extent that they are applicable to the Contract or required by law to be so incorporated.
29. Contractor and subcontractors shall comply with the Oregon Consumer Identity Theft Protection Act (ORS 646A.600 et seq.).
30. Indemnification. To the fullest extent authorized by law, Contractor agrees to indemnify, defend, reimburse and hold harmless County, its officers, employees and agents (the "Indemnified Parties") from any and all threatened, alleged or actual claims, suits, allegations, damages, liabilities, costs, expenses, losses and judgments, including, but not limited to, those which relate to personal or

real property damage, personal injury or death, attorney and expert/consultant fees and costs, and both economic and non- economic losses, to the extent caused by the negligence, breach of contract, breach of warranty (express or implied), or other improper conduct of Contractor, its employees, subcontractors, or anyone for whose acts Contractor is responsible. If claims are asserted against any Indemnified Party 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 Contractor's indemnification obligation and other obligations under this section shall not be limited by any limitation on the amount or type of damages, compensation, or benefits payable to the employee by or for the Contractor or subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

31. For all Public Improvement Contracts, contractor and subcontractors must have must have a public works bond filed with the Construction Contractors Board before starting work on the project, unless the contractor or subcontractor is exempt under ORS 279C.836 (Public works bond) (4), (7), (8) or (9). ORS 279C.830

END OF SECTION

SECTION 01 10 00 – SUMMARY OF WORK

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. General Requirements.

B. Work Covered by Contract Documents.

C. Contractor Use of Premises.

D. Related Work by Owner.

E. Owner Furnished Products.

F. Contractor Designed Elements.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. General

1. The Work shall be providing all supplies, tools, equipment, scaffolding, transportation, utilities, service, superintendence, labor, and the furnishing of all materials, items, and accessories needed for the Baker County Emergency Operations Center.
2. The intent of the Contract Documents is that a single Contractor completes the project including the furnishing of all supervision, material, labor and equipment to provide complete and operative systems.
3. All on-site work, including demolition, installation and final cleaning is required to be completed during the regularly scheduled hours. Contractor is to coordinate work to accommodate the continuous operation of the adjacent streets and utilities, without interruption or hindrance.

B. Description

1. Baker County Facilities Department: The Project consists of building an addition to the existing Baker County Sheriff's building in Baker City, Oregon. The addition will provide a new workspace for the 911 dispatch responders, a large flexible area for emergency response staff across many regional services to co-office and work together in emergency situations, as well as restrooms, secure entry, and support spaces for communication and infrastructure. The building’s exterior walls will be constructed using ICF (insulated concrete formwork), with a conventionally framed truss, exterior roof deck insulation, and a low-slope membrane roof. Interior walls will be cold-formed steel construction, with cost-effective finishes throughout.

2. The Contractor shall provide for all scheduling, coordination, cutting and patching and all other items required by the contract Documents to complete the Work and provide complete operational systems.

C. No officer or employee of Baker County has any authority to place any interpretation, either verbal or written, upon the contents and description of work included in the Contract Documents.

D. Prior to bidding, the Contractor shall visit the site during the Mandatory Pre-Bid Meeting only and fully inform himself of the areas in which work is to take place, including the limits of area allowed for working conditions, the areas limited for access to the work, and the areas available for the delivery and storage of new material. Access to the site is to be coordinated by, and at the convenience of, the Owner and the building occupants.

E. The Contractor represents that he has carefully examined prior to bidding, all Contract Documents and site conditions, understanding the character, quality and quantity of work called for and all conditions of the contract.

1.03 CONTRACTOR'S USE OF PREMISES

A. The Contractor's work limits are as indicated on the Drawings.

C. Contractor shall limit his use of premise for Work and for storage to allow for:

1. Owner occupancy and operations.
2. Public use.
3. Coordinated use of premises under direction of the Owner.
4. Full responsibility for protection and safekeeping of products under this Contract stored at Site.
5. Moving stored products, under Contractor's control, which interfere with operations of Owner or separate Contractor.
6. Obtaining and paying for use of additional storage or work areas needed for operations.
7. Conformance to fire/life/safety requirements and fire equipment access.
8. Worker vehicle parking on-site.
9. Storage of all materials required for the project on-site.

D. Construction Operations:

1. Do not unreasonably encumber Site and Structure with materials or equipment.
2. Do not load structure with weight that will endanger structure.
3. Contractor shall direct all construction vehicle and delivery traffic along an access route as approved by the Owner.

1.04 EXCESSIVE NOISE

A. Minimize noise during working hours. Notify Owner at least 24 hours prior to any necessary excessive noise. Comply with Owner's instructions.

1.05 OWNERS SALVAGED MATERIALS

A. The owner may salvage selective items in good condition that are removed during the demolition phase. Contractor to schedule a pre-demolition walk-thru with the Owner, including the maintenance and technology departments, is to allow the Owner the opportunity to review demolished materials and equipment to determine which items are to be salvaged.

B. Contractor is to relocate salvaged items to a storage location as directed by the Owner for reclamation by Baker County Facilities Department.

C. Contractor is to dispose off-site all materials and equipment not selected by the Owner for salvage, in a manner approved and authorized by all State, County, City and all other Governing Agencies.

1.06 RELATED WORK BY OWNER OR OTHERS

A. NIC & OFOI Items: If applicable, items designated on the Drawings and/or described in the Project Manual as "NIC" (Not in Contract) or "OFOI" (Owner Furnished and Owner Installed) are not included in the Contract.

B. Contractor's Responsibilities:

1. Designate delivery date for each portion of the Work in the Progress Schedule.
2. Storage of products if requested.
3. Coordinate installation with the Progress Schedule.
4. Provide all preparatory work necessary for proper installation including blocking and backing and finish work including caulking, grouting, furring, preparation of subfloors for finish flooring materials, and painting adjacent surfaces as required for NIC or OFOI equipment.

1.07 OWNER-FURNISHED PRODUCTS

A. OFCI Items: If applicable, items designated on project Drawings and/or described as "OFCI" (Furnished by Owner and installed by Contractor).

B. Owner's Responsibilities for OFCI Equipment:

1. Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
2. Deliver supplier's bill of materials to Architect for review.
3. Arrange and pay for delivery to site in accordance with Progress Schedule.
4. Inspect deliveries jointly with Contractor.
5. Submit claims for transportation damage.
6. Arrange for replacement of damaged, defective, or missing items.
7. Arrange for manufacturers' field services; arrange for and deliver manufacturers' warranties and bonds to Contractor.

C. Contractor's Responsibilities:

1. Designate submittals and delivery date for each product in Progress Schedule.
2. Review shop drawings, product data, samples, and other submittals. Submit to Architect with notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
3. Receive and unload products at site.
4. Inspect deliveries jointly with Owner, record shortages and damaged or defective items.
5. Handle products at site, including uncrating and storage.
6. Protect products from damage and from exposure to elements.
7. Coordinate, provide and install appropriate backing for connections.
8. Assemble, install, connect, adjust, and finish products as stipulated in respective specification sections.
9. Provide installation inspections required by public authorities.
10. Clean, repair, or replace items damaged by Contractor.
11. Remove and dispose of crating and packing materials for Owner-furnished materials and equipment delivered to the site.

1.08 CONTRACTOR DESIGNED ELEMENTS

A. Where work of this Contract requires bidder design, comply with following requirements.

1. Submit Shop Drawings and Calculations to Architect for review.
2. Submit Shop Drawings and Calculations to City or County for approval and permits.
3. All Shop Drawings and Calculations shall be stamped by Registered Architect or Engineer licensed in State of Oregon.

1.09 EXISTING UTILITIES

A. Utilities of record are shown on the Drawings insofar as possible to do so. These, however, are shown for convenience only and the Owner and Architect assume no responsibility for improper locations or failure to show utility location on the Drawings. The Contractor is responsible for determining the location of all existing utilities (whether shown or not) prior to commencing work. At Contractor's expense, immediately repair and restore operation of any utilities damaged during construction; conform to utility company's repair requirements.

1.10 OBJECTIONS TO APPLICATION OF PRODUCTS

A. All Contractors submitting a bid for this Project shall thoroughly familiarize themselves with specified products and installation procedures and submit to Design Consultant any objections (in writing) no later than seven (7) days prior to Bid Date. Submittal of Bid constitutes acceptance of products and procedures specified.

1.11 MISCELLANEOUS

A. Work includes, but is not limited to:

1. Maintaining pedestrian and vehicular access to and around existing facilities.
2. Not encumbering site access with materials or equipment.
3. Obtaining and paying for use of additional storage or work areas needed for operations.
4. Contractor is responsible for controlling dust, sedimentation, and erosion on site. Wind born dust is to be controlled by continuous watering of disturbed ground. Erosion and sedimentation control are to be provided in compliance with Baker City ordinances and Department of Environmental Quality regulations. Sedimentation is not allowed to leave the site. Standing water is not to be allowed in such a capacity to hinder construction operations or emergency vehicle access and operations.

PART 2 – PRODUCTS
Not Used

PART 3 – EXECUTION
Not Used

END OF SECTION

SECTION 01 23 00 - ALTERNATES

PART 1 GENERAL

1.01 ALTERNATIVE BID ITEMS

A. Alternates are described throughout the Contract Documents (Drawings and Specifications). Procedures for recording and noting alternate bid items are indicated in Sections 00 2113 and 00 4100 of the General Conditions. Contractor shall note description of alternate bid items and provide an individual separate price, which includes all costs necessary to add or deduct the cost of said bid item from the Base Bid price. Both additive and deductive bid alternates are indicated on the Drawings and Specifications.

B. The Owner reserves the right to accept any one, all, or none of the alternate bid items. The determination of the lowest bonafide bid will include an evaluation of alternates to be accepted by the Owner.

C. In preparing his price for each alternate bid item, the Contractor shall include all costs necessary to provide and install complete and in operating order in accordance with Contract Documents, and as indicated in the General Requirements and General Conditions, all component parts necessary to add or deduct each alternate bid item individually.

D. Bidding Requirements:

1. Refer to the Bid Form (Section 00 4100) to list all appropriate costs attributed to the alternates described in this section.
2. The alternate bid items are clearly described in the Contract Documents. It is the responsibility of the bidding Contractor to realize that described or inferred adjustments may be necessary due to the acceptance or rejection of alternate bid items. All alternate bids are to be complete bids.
3. Additive alternates are all inclusive of the additional work described.
4. Deductive alternates include all work necessary to provide and install materials necessary to finish the affected system or area.

D. Following are the descriptions of the alternate bid items. The Contractor shall note on the Bid Form clearly whether each individual item is additive or deductive in the space provided:

1.02 DESCRIPTION OF ALTERNATES

A. ALTERNATE NO. 1 - N/A

B. ALTERNATE NO. 2 - N/A

C. ALTERNATE NO. 3 - N/A

1.03 DESCRIPTION OF UNIT PRICES

Not Used

END OF SECTION

SECTION 01 25 00 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Substitutions During Bidding: Instructions to Bidders.

B. Shop Drawings, Product Data, Samples: General Conditions and Section 01 3300.

1.02 CONTRACTOR'S OPTIONS

A. For products specified only by reference standards, select any product meeting standards, by any manufacturer.

B. For products specified by naming several products or manufacturers, select any product and manufacturer named.

C. For products specified “Basis of Design,” use the product specified or follow the procedure outlined below for approval of different products.

D. If products or manufacturers are not named in the specified sections, contractors shall follow the procedure outlined below for approval.

1.03 SUBSTITUTIONS

A. During bidding, the Architect will consider requests for substitutions only when received on the form provided as pages 01 2500-3 & 4. No request will be considered unless received seven (7) days prior to the time and date set for the receipt of bids. Requests for substitutions after the bid date will be only considered if in conformance to specified section 01 2500-1.06. All Substitution Requests shall be submitted electronically.

B. In connection with the use of any substitute item approved by the Architect it shall be in the Contractor's responsibility to see that such items meet all space requirements, and that any alterations to connecting items necessitated by use of the alternate items are properly made, at no increase in cost to the Owner.

C. Specific reference in the specifications to any article, device, product, materials, form or type of construction, etc., by name, make or catalog number, shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.

D. In making request for substitution, Bidder/Contractor represents:
   1. They have personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.
   2. They will provide the same guarantee for substitution as for product or method specified.
   3. They will coordinate installation of accepted substitution into Work, making such changes as may be required for Work to be complete in all respects at no additional cost to Owner.
   4. They waive all claims for additional costs or time extensions related to substitution which consequently becomes apparent.
   5. They will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. In order to allow the fullest competition, consistent with the Owner's interests, the Architect will give consideration, prior to submission of proposals, to requests for approval of products and materials competitive with and similar to those specified by proprietary name.

F. To be considered and in order to facilitate review of requests for approval of substitutions for specified products or materials, all such requests shall be made in writing on the form included as a part of this section.

G. Should any proposed product substitution require any redesign work to accommodate the substitute product, costs for such re-design work shall be included in the Bid amount and shall be paid to the Owner in the required re-design work.

1.04 ARCHITECT'S OPTIONS

A. Architect will be sole judge of acceptability of any proposed substitution – unless products have been specifically designated as non-substitutable by the Owner.

B. Only listed products in this Project Manual or approved substitutions may be used on Contract Work.

C. Each request for substitution approval shall include:

1. Identity of product for which substitution is requested; include specification page and paragraph number.
2. Identity of substitution; include complete product description, drawings, photographs performance and test data, and any other information necessary for evaluation.
3. Quality comparison of proposed substitution with specified product.
4. Changes required in other work because of substitution.
5. Effect on construction progress schedule.
6. Cost comparison of proposed substitution with specified product.
7. Any required license fees or royalties.
8. Availability of local maintenance service.
9. Source of replacement materials.

1.05 DURING BIDDING PERIOD

A. No request for substitution approval will be considered unless a written request in triplicate has been submitted on Standard Form bound hereinafter, and has been received by Architect seven (7) days prior to the time and date set for receipt of bids.

B. Request submitted without self-addressed and stamped envelope will not be individually acknowledged.

1.06 AFTER CONTRACT AWARD

A. Approval will be granted by the Owner only when:
1. Specified product cannot be delivered without project delay, or
2. Specified product has been discontinued, or
3. Specified product has been replaced by superior product, or
4. Specified product cannot be guaranteed as specified, or
5. Product will not perform properly, or
6. Specified product will not fit within designated space, or
7. Specified product does not comply with governing codes or regulations, or
8. Substitution determined by the Owner to be in his best interest.

TO: **Cole Architects**
1000 NW Wall St, Suite 205
Bend, OR 97703

PROJECT NAME: BAKER COUNTY EMERGENCY OPERATIONS CENTER

We hereby submit for consideration the following product instead of the specified item for the above project:

Section: _____ Paragraph: _____

Specified Item _____

Proposed Substitution: _____

Attach complete dimensional information and technical data including laboratory tests, if applicable.

Include complete information on changes to Drawings and/or specifications, which proposed substitution will require for its proper installation.

Submit with request all necessary samples and substantiating data to provide equal quality, performance, and appearance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance. Differences in quality of materials and construction shall be indicated.

The undersigned states that the following paragraphs, unless modified on attachments, are correct:

1. The proposed substitutions do not affect dimensions shown on drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The proposed substitution will have no affect on applicable codes.
6. The manufacturer's guarantee or warranties of proposed product is equivalent to; or exceeds that of the specified product.
7. Proposed substituted item will match all sizes, profiles, specifications and colors of item originally specified.

List of names and location of three similar projects on which product was used, date of installation, and Architect's name and phone number.

Project No. 1: _____
Project No. 2: _____
Project No. 3: _____

CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

UNDERSIGNED ATTESTS THAT FUNCTION AND QUALITY ARE EQUAL TO OR SUPERIOR TO SPECIFIED ITEMS.

FOR USE BY ARCHITECT:

_____Accepted _____Accepted as Noted
_____Not Accepted_____Received Too Late

By: _____
Date: _____
Remarks: _____

Submitted By: _____ _____

Signature : _____ _____

Title: _____ _____

Firm: _____ _____

Address: _____ _____

_____ _____

Telephone: _____ _____

Date : _____ _____

_____ _____

Above signature must be by person having authority to legally bind his firm to the above terms.

END OF SECTION

SECTION 01 26 13 – REQUESTS FOR INTERPRETATIONS

PART 1 - GENERAL

1.01 GENERAL

A. In addition to requirements stipulated in General Conditions the following shall apply to this Contract:

1. In event that the Contractor or a Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Document require clarification or interpretation, the Contractor shall submit a Request for Interpretation (RFI) to the Architect.
2. The RFI shall clearly and concisely set forth the issues for which the clarification or interpretation is sought, and why a response is needed. The RFI shall also set forth the Contractor's interpretation or understanding of the issues.
3. Prior to submitting a RFI from a Subcontractor, the General Contractor shall review the RFI for appropriateness and completeness and, if needed, obtain clarifications from the Subcontractor.
4. The Architect will review each RFI, and determine whether or not the document qualifies as a Request for Interpretation as defined below. If the Architect determines that the document is not a legitimate RFI, it will be returned to the Contractor unreviewed as to content.
5. The Architect will respond to RFI's within 5 working days of receipt from the Contractor, unless a longer time will be required to provide an adequate response. If a longer time is determined necessary, the Architect will, within 5 working days, notify the Contractor of the anticipated response time. An extension to the Contract Time will not be considered unless the Contractor submits a written request for extension to the Architect within 5 working days thereafter.
6. Unless specifically noted to the contrary, RFI responses from the Architect will not alter requirements of the Contract Documents. If the Contractor believes that an Architect's response does affect the Contract Sum or Contract Time, the Contractor shall, within 5 working days, submit a written notice to the Architect, stating proposed changes and documenting the reasons for such changes. Failure to give such notice shall waive the Contractor's right to seek additions to the Contract Sum or extensions to the Contract Time under the Changes Article of the General Conditions.

1.02 UNACCEPTABLE RFI CLAIMS

A. The Owner will not authorize increases to the Contract Sum or extensions to the Contract Time caused by Contractor's additional field or office staffing, project delays, decreased labor productivity, etc. when such claims are caused by any or all of the following:

1. Project Communications:
   a) Routine communications between the Owner, Architect, and Contractor, including correspondence, memos, field-reports, test-reports, telephone calls, faxed messages, E-mail, etc.

2. Substitution Requests:

a) Requests by Contractor to substitute products or methods of construction.

Shop Drawings & other Submittals:

a) Contractor prepared drawings, product data, samples, etc. submitted for Architect's review to ascertain that Contractor clearly understands Project design intent and Contract Document requirements.

3. Value Engineering Requests:

a) Communications regarding Contractor-originated Value Engineering requests.

4. Non-conforming Work:

a) Communications regarding Work that has not been performed in compliance with the Contract Documents.

5. Finding Existing Information:

a) Directing Contractor where to locate requested information within Drawings, Specifications, or other Contract Documents.

1.03 REQUESTS

A. Requests may be submitted only when Requestor cannot obtain interpretations or information through research, Contract Documents review, or other reasonable means.

B. Requests shall include the following information:

1. Sequential Request Numbers
2. Sender's & Receiver's names, firm names, and related addresses
3. Request Issue Date
4. Requested Reply Date
5. Request Description
6. References & Attachments
7. Sender's Recommendations
8. Space for Receiver's Response

C. Submissions of Requests shall be through the Electronic Management Procedures, Section 01 30 00.

END OF SECTION

SECTION 01 26 63 – CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.1 RESPONSIBLE PARTIES

A. Immediately following Contract execution, Owner will and Contractor shall identify who, within their respective organizations, will be responsible for executing Change Orders. Architect, Contractor and Owner shall each separately maintain a log of all COR's, RFP's and RFI log, however, Contractor will maintain the official COR's, RFP's and RFI log.

1.2 RELATED SECTIONS

A. General and Supplementary Conditions

B. Section 01 2500: Product Substitutions

C. Section 01 3000: Electronic Management Procedures

D. Section 01 3200: Construction Progress Schedules

E. Section 01 7800: Contract Closeout

F. Section 01 7839: Project Record Documents

1.3 DEFINITIONS

A. Proposal Request:

1. Means request from Architect to Contractor for changes to Contract sum and/or Contract Time for proposed changes to the Work.

B. Change Order:

1. See General Conditions.

C. Construction Change Directive:

1. Means written order to Contractor executed on AIA Form G713 or other similar form designated by the Owner, and signed by Owner and Architect, which amends Contract Documents as described, and authorizes Contractor to proceed with change affecting Contract Sum and/or Contract Time, for inclusion in subsequent Change Order.

D. Architect's Supplementary Instructions

1. Means written order, instruction, or interpretation to Contractor, executed on AIA Form G710 or other similar form designated by Architect, and signed by Architect, which authorizes minor changes in Work not altering Contract Sum and/or Contract Time.

E. Request for Interpretation (RFI):

1. See Section 00 9300: Requests for Interpretation

1.4 OWNER OR ARCHITECT INITIATED CHANGES

A. Requests will include:

1. Detailed description of change, including change location and products.
2. Supplementary or revised Drawings and Specifications.
3. When appropriate, projected time span for making change, and specific statement as to whether or not overtime work is authorized.
4. When appropriate, specific time period during which request price will be considered valid

B. Such request is for information only, and is not an instruction or authorization to execute the change or an order to stop Work in progress.

1.5 CONTRACTOR INITIATED CHANGES

A. Requests shall include

1. Description of proposed change
2. Statement of reason for making change
3. Statement of effect upon Contract Sum and Contract Time
4. Statement of effect upon work of other Contractors
5. Statement of effect upon work by Owner
6. Documentation supporting any change to Contract Sum and/or Contract Time

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. In lieu of Proposal Request, Architect may issue Construction Change Directive for Contractor to proceed with change for subsequent inclusion in future Change Order.

B. Directive will describe Work changes with attachments of revised Contract Documents defining details of change, and designating any changes in Contract Sum and/or Contract Time.

C. Owner and Architect will sign and date Construction Change Directive as authorization for Contractor to proceed with changes.

D. Upon receipt of the Construction Change Directive the Contractor shall proceed with the work as directed.

1.7 DOCUMENTATION OF PROPOSALS & CLAIMS

A. Support quotation for each Proposal with sufficient substantiating data to allow Architect to evaluate quotation.

B. When requested by Architect, submit the following Cost and Time data:

1. Labor required
2. Equipment required
3. Products required
    a. Quantity required
    b. Purchase source

c. Unit cost

4. Credit for deleted Work, similarly documented
5. Overhead and profit
6. Justification for any change in Contract Time

C. Support each claim for additional cost, and for work done on time-and-material/force account basis with documentation as required for lump-sum proposal, plus the following information:

1. Name of Owner's authorized agent who ordered work, and date of order.
2. Dates and times of work performed, and by whom.
3. Time records, including summary of hours worked, and hourly rates paid.

D. Support all costs of Requests or Claims as outlined in Article 12 of the General Conditions of the Contract.

1.8 PREPARATION OF CHANGE ORDERS

A. Architect will prepare each Change Order.

B. Change Order Form: AIA Document G-701.

C. Change Order will describe Work changes with attachments of any revised Contract Documents, which define Change details.

D. Change Order will adjust Contract Sum and/or Contract Time.

1.9 LUMP-SUM/FIXED PRICE CHANGE ORDERS

A. Change Order contents will be based on, either:

1. Architect’s Proposal Request and Contractor's responsive Proposal as mutually agreed between Owner and Contractor.
2. Contractor’s Change Proposal as recommended by Architect, and as mutually agreed between Owner and Contractor.

B. Owner and Architect will sign and date Change Order as authorization for Contractor to proceed with Changes.

C. Contractor shall sign and date Change Order to indicate agreement with specified terms.

1.10 UNIT PRICE CHANGE ORDERS

A. Change Order contents will be based on, either:

1. Architect’s definition of required changes.
2. Contractor’s Change Proposal as recommended by Architect
3. Survey of completed work.

B. Unit Price amounts shall be, either:

1. Those stated in Agreement, if any.
2. Those mutually agreed upon between Owner and Contractor.

C. When quantities of Items affected by Change Order can be determined prior to start of work:

1. Owner and Architect will sign and date Change Order as authorization for Contractor proceed with changes.
2. Owner and Architect will sign and date Change Order to indicate agreement with specified terms.

D. When quantities of Items affected by Change Order cannot be determined prior to start of work:

1. Architect or Owner will issue Construction Change Authorization directing Contractor to proceed with change on basis of unit prices, and will cite applicable unit prices.
2. At change completion, Architect will determine work cost based upon agreed unit prices and quantities used.
3. Contractor shall submit documentation to establish quantities of units or each Item and any claim for change in Contract Time.
4. Owner and Contractor will sign and date Change Order to indicate their agreement with specified terms.

1.11 TIME & MATERIAL & FORCE ACCOUNT CHANGE ORDERS

A. Architect and Owner will issue Construction Change Authorization directing Contractor to proceed with changes according to the process defined in the General Conditions.

B. At Change completion, Contractor shall submit itemized accounting of change with supporting data as specified above in “Documentation of Proposals and Claims.”

C. Architect will determine allowable cost of such work, as provided in Contract Conditions.

D. Architect will sign and date Change Order to establish change in Contract Sum and/or Contract Time.

E. Owner and Contractor will sign and date change order to indication their agreement with specified terms.

1.12 CORRELATION OF CHANGE ORDERS WITH CONTRACTOR’S OTHER SUBMITTALS

A. Revise Schedule of Values and subsequent Request for Payment Forms to record eac Change as separate item of work, and to record adjusted Contract Sum.

B. Revise Construction Schedule to reflect each change in Contract Time.

C. Revise Subschedules to show changes for other items of Work affected by Changes.

D. Upon completion of Change Order Work, record pertinent changes in Record Documents.

END OF SECTION

SECTION 01 29 00 – APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Section 00 7000: General Conditions

B. Section 00 7300: Supplementary Conditions

C. Section 01 1000: Summary of Work

D. Section 01 2973: Schedule of Values

E. Section 01 3126: Electronic Management Procedures

F. Section 01 7800: Contract Closeout

1.02 ANTICIPATED PAYMENT AMOUNTS

A. To assist Owner in establishing his Construction Financing and budget cash flows, the Contractor, prior to submitting his first Application for Payment, shall deliver to Architect a schedule of anticipated payment amount to be requested with each subsequent application.

1.03 FORMAT AND DATA REQUIRED

A. Submit itemized applications typed on AIA Document G702, Application and Certificate for Payment, together with Continuation Sheets AIA Document G703 or similar form approved by the Architect.

1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form:

1. Fill in required information.
2. Fill in summary of dollar values to agree with respective totals indicated on Continuation Sheets.
3. Execute certification with signature of responsible officer of Contracting Firm.

B. Continuation Sheets:

1. Identify each major item of Work by number and title matching those listed in Table of Contents of this Project Manual.
2. Fill in scheduled Dollar Value for each Item.
3. Fill in Dollar Value in each Column for each scheduled Line Item when Work has been performed or Products stored.
4. Round off Values to nearest dollar.
5. List each Change Order, executed prior to date of submission, at end of Continuation Sheets. Include Change Order Number and brief description.

1.05 SUBSTANTIATING DATA

A. Submit, when requested by Architect, to justify Line Item amounts.

1.06 APPLICATION SCHEDULE

A. Refer to the General Conditions for schedule.

1.07 SUBMITTAL PROCEDURE

A. Submit Applications for Payment to Architect at times stipulated.

B. Submit Application electronically.

C. When Architect finds Application properly completed and correct, he will transmit Certificate for Payment to Owner, with copy to Contractor.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

SECTION 01 29 73 – SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Change Order Procedures: Section 01 2663.

1.2 SCHEDULE FORMAT

A. Type Schedule on AIA Document G-703, Application for Payment, Continuation Sheet or similar form approved by the Architect.

B. Forms can be obtained from:

1. AIA Service Corp., Publications Div., 1735 New York Avenue, Washington D. C. 20006.

2. Portland Chapter AIA Office, 403 NW 11th Avenue, Portland, Oregon 97209 (503-223-8757).

1.3 SCHEDULE HEADINGS

A. Identify each major Work Item by number and title.

B. Coordinate Headings with Construction Progress Schedule.

1.4 CONTENT

A. As basis for computing Progress Payment values, separately list installed value of each of the following:

1. Each major Work Item.

2. Each Subcontracted Work Item. For each major Subcontractor, list products and operations of that Subcontract as separate Line Items.

3. Any Products to be stored, for which separate payments will be requested.

B. Include directly proportional amount of Contractor's Overhead and Profit in each Component Listing.

C. Round off Values to nearest Dollar.

D. Sum of Values listed shall equal total Contract Sum.

1.5 SUBMITTAL REQUIREMENTS

A. Submit 3 copies of Schedule at least 5 days prior to first Application for Payment.

B. Form and content shall be acceptable to Architect.

1.6 SUBSTANTIATING DATA

A. When requested by Architect, submit justifying Substantiating Data on Line Item Amounts in question.

END OF SECTION

SECTION 01 31 00 – PROJECT COORDINATION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. General and Supplementary General Conditions
B. Section 01 1000: Summary of Work.
C. Section 01 3119: Meetings.
D. Section 01 3126: Electronic Management Procedures.
E. Section 01 3200: Schedules and Reports.
F. Section 01 3300: Submittal Procedures - Shop Drawings, Product Data, and Samples.
G. Section 01 5000: Temporary Facilities.
H. Section 01 7329: Cutting and Patching.
I. Section 01 7413: Cleaning.
J. Section 01 7800: Contract Closeout.

1.02 CONSTRUCTION ORGANIZATION AND START-UP

A. Establish on-site lines of authority and communications including the following:

1. Attend Pre-construction Meeting and Progress Meetings as required by the Architect or Owner.

B. Comply with procedures for intra-project communications including:

1. Submittals
2. Reports and records
3. Recommendations
4. Coordination drawings
5. Schedules
6. Resolution of conflicts

C. Contract Documents Interpretation:

1. Consult with Architect to obtain interpretation.
2. Assist in resolution of questions and conflicts that may arise.
3. Transmit written interpretations to Subcontractors, and to other concerned parties.
4. Permits and Approvals:
   a. Verify in writing to Architect within thirty (30) days after Notice to Proceed that Subcontractors have obtained required permits and inspections for work and for temporary facilities.

D. Control Use of Site:

1. Supervise field engineering and Project layout.
2. Allocate field office and storage space and work and storage area for use of each Subcontract or Contractor.

E. Access to the Site and Contractor Responsibilities:

1. Access to the site is to occur via the existing roads onto County grounds from Baker City public access streets. Contractor is to coordinate and maintain existing (or establish safe temporary alternative) drop off areas, whether by bus or private vehicle and maintain access to building for delivery activities of the existing building. Contractor is to maintain safety barricades as appropriate for the work being conducted and control of traffic on

public streets.

1.03 COORDINATING SUBCONTRACTORS' WORK

A. Coordinate the Work of all Subcontractors and make certain that, where the Work of one trade is dependent upon the Work of another trade, the Work first installed is properly placed, installed, aligned, and finished as specified or required to properly receive subsequent materials applied or attached thereto.

B. Direct Subcontractors to correct defects in substrates they install when Subcontracts of subsequent materials have a reasonable and justifiable objection to such surfaces.

C. Do not force Subcontractors to apply or install products to improperly finished product.

D. Coordinate changes to assure that:

1. Requirements of Contract Documents are fulfilled.
2. Changes in Contract requirements of all affected trades are reflected in executed Change Orders.

E. Scheduling and Installation Sequence:

1. Coordinate scheduling, submittals, and Work of various sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

2. Schedule work in accordance with current Project construction schedule.

a. Coordinate schedules of all trades.
b. Verify timely deliveries of products for installation by other trades.
c. Verify that labor and equipment are adequate for work and schedule.
d. Verify that material deliveries are adequate to maintain schedule.

F. Space Requirements:

1. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings.
2. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building.
3. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

G. Concealed Services:

1. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction.
2. Coordinate locations of fixtures and outlets with finish elements.

H. Ascertain need for cutting and patching, and coordinate with work of other trades, and the Architect.

I. Completion and Clean Up:

1. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner occupancy.

J. Start-Up, Inspection, and Acceptance of Equipment:

1. Verify that manufacturer's representative is present.

2. Verify that utilities, specified connections, and safety devices are complete and equipment is ready to operate.
3. Verify that equipment has been tested, adjusted, and balanced, is cleaned, repainted as required, and operational prior to inspection.
4. Coordinate and comply with requirements for Start-up Functions, Training, and Equipment Inspections with Owner's Commissioning Agent.

K. Access for Corrective Work:

1. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.04 COORDINATING UTILITIES

A. The Contractor shall be responsible for coordination of all utilities to be installed for service to the project and shall cooperate with all utility agencies. Utilities may include, but are not limited to, water, sewer, natural gas, telephone, electrical, fiber optic, and cable. The Contractor shall maintain communication with the utilities in order to coordinate time and requirements of the utilities' installation.

B. The Contractor shall provide all work necessary to comply with the requirements of the Contract Documents for work by the utility company that does not meet the Contract Document requirements, or for work that is disturbed by the utility installation.

C. The Contractor shall be responsible to locate and protect existing utilities.

D. The Contractor shall comply with ORS 757.541 through 757.571 relating to notice prior to excavation.

1.05 CLOSE-OUT DUTIES

A. At completion of Work of each subcontract, conduct inspection to assure that:

1. Work is acceptable and in compliance with the requirements of the Contract Documents.
2. Assist the Architect in inspection.
3. Temporary facilities and debris have been removed from Site.

B. Substantial Completion:

1. Conduct inspection and prepare list of work to be completed or corrected.
2. Assist Architect in inspection.
3. Supervise correction and completion of Work as established in Architect's inspection reports and "punchlists".
4. Obtain all approvals from governing authorities, including the Certificate of Occupancy.

C. Final Completion:

1. Submit and obtain approval of all contract close-out documents.
2. Assist Architect and Owner in inspection.

1.06 OWNER'S NOTICE

A. The Contractor shall give the Owner, forty-eight (48) hours advance notice of his intention to work overtime, nights, Sundays or holidays, or anytime outside the usual working hours. In no case will the Contractor do any such work without first notifying the Owner to permit arrangements for proper inspection. Unless of an emergency nature, compensation for work performed in violation of this paragraph will not be made.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 31 19 - MEETINGS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included:

1. In general, project meetings will be held weekly at the job site, or in a mutually agreed upon location, in accordance with a mutually acceptable schedule. The Contractor will conduct project meetings throughout the construction period.
2. The purpose of the project meetings is to enable orderly review of progress during construction and to provide for systematic discussion and analysis of problems that might arise between the Owner, Architect and/or Contractor relative to execution of the Work.

1.02 RELATED SECTIONS

A. Section 01 3126: Electronic Management Procedures

1.03 AUTHORITY DESIGNATION

A. Persons designated by the Contractor to attend and participate in project meetings shall have all required authority to commit the Contractor to solutions as agreed upon in the project meetings.

1.04 SUBMITTALS

A. Agenda Items: To the maximum extent possible, advise the Owner at least twenty-four (24) hours in advance of the project meeting regarding all agenda items to be discussed.

1.05 AGENDA

A. Pre-construction Meeting

1. The Owner in conjunction with the Architect will conduct this meeting within ten (10) days after date of Notice to Proceed with work at the Project Site.
2. Location: To be determined.
3. Attendance:
    a. Owner and his representatives
    b. Architect and his Professional Consultants
    c. Contractor's Project Manager and Superintendent
    d. Major Subcontractors
    e. Major Suppliers, as appropriate
    f. Others, as appropriate
4. Suggested Agenda:
    a. Distribution (by Contractor) and discussion of:
        1) List of major Subcontractors and Suppliers
    b. Critical Work sequencing
    c. Major Equipment deliveries and priorities
    d. Project Coordination
    e. Designation of responsible personnel
    f. Procedures and processing of:
        1) Field decisions
        2) Proposal requests
        3) Submittals
        4) Change Orders

5) Applications for Payment
6) Schedules and Reports

g. Procedures for maintaining Record Documents
h. Use of premises:
1) Office, work, and storage areas
2) Owner's requirements
i. Construction facilities, controls, and construction aids
j. Temporary utilities
k. Safety and first-aid procedures
l. Security procedures
m. Housekeeping procedures

B. Project Meetings

1. The Contractor will conduct weekly meetings at the Project Site, during the course of the installation, in the job trailer required under Division 01 5000, to coordinate the Work, answer questions, and resolve problems.
2. Suggested Meeting Agenda:
a. Attendees:
List of attendees and company they represent.
b. Minutes Review:
Corrections, additions and/or deletions to previous minutes
c. Outstanding Action Items:
Review of items not resolved from previous meeting
d. Technical Concerns:
Discussion of technical aspects of the project including problems to be resolved under the following categories:
Civil/Landscape
Mechanical
Electrical
Architectural
Technology/Data
e. As-Built Review:
Confirm results of the as-built review
f. Shop Drawings:
Confirm results of shop drawing review; list those not submitted by Contractor that are due and shop drawings not returned by Architects or Engineers.
g. RFI's:
Confirm approved and outstanding RFI's.
h. RFP's:
Confirm approved and outstanding RFP's.

i. Schedule Review:
Confirm status of work, areas of concern and general status of work as of the meeting date.
j. Projection of Work:
Discussion of anticipated concentration of work for the next period.

k. Procurement:
Verify and update status of procurement activities.

l. Other Concerns:
Any other items to be discussed

m. Review of all Action Items:
Each action item will be consolidated with item, action person responsible and date to be resolved.

n. Summary:
Confirmation of next meeting date, location and time, plus those requested to be in attendance.

3. All items to be discussed shall be brought up at the time the appropriate agenda item is discussed. All attendees shall familiarize themselves with the agenda and be prepared in advance with their items for discussion.

C. Special Meetings: The Owner may call special meetings at the project site or at other locations to coordinate the work, answer questions, and resolve problems.

1.06 PREINSTALLATION CONFERENCES

A. When required in individual Specification Sections and/or as requested, convene pre-installation conference at work Site prior to commencing work of Section.

B. Require attendance of parties directly affecting, or affected by, work of specific Section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda, preside at conference, record minutes, and distribute copies within two days after conference to participants, with electronic copy to Architect.

E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.07 MINUTES

A. The Contractor will compile minutes of each project meeting and will distribute copies to all interested parties within seven (7) days after the meeting. Items in the minutes shall be numbered consecutively and grouped under divisions and sections. Each item shall be carried forward until resolved.

B. The minutes compiled by the Contractor will be the official record minutes and all clarifications and/or corrections shall be transmitted in writing to the Owner within fourteen (14) days of date of receipt of the minutes or unless noted during the next schedule meeting under the appropriate agenda item. Transmitted corrections shall be legibly submitted on company letterhead.

C. One (1) bound volume of all minutes or access to them through the electronic management procedures shall be maintained by the Contractor in the job office until project completion.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 31 26 – ELECTRONIC MANAGEMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Construction Administration communication shall be transmitted to each project entity in electronic (PDF) format using construction management software, specifically designed for transmitting construction communications between project team members.

B. The intent of electronic communication is to increase collaboration, expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.

C. The Documentation created and tracked in the construction management software and transmitted electronically shall include the following:

1. RFI's
2. ASI's
3. APR's
4. Change Orders
5. Submittals

Plans and specifications and any updates thereto will be reviewable within this system.

D. Definitions:

1. RFI – Request for Interpretation
2. GC – General Contractor
3. QC – Quality Control

1.02 PROCEDURES

A. RFI (Requests for Interpretation) Procedure – GC's RFI's will be reviewed via the construction management software website. Subcontractors RFI's will be reviewed by the GC before the Architect or Architect's Consultants. Once the GC review is complete, the GC will either respond with an answer or forward the RFI to the Architect for a formal response. All responses to RFI's will be emailed to the Contractor via (PDF) with a link to the construction management software website embedded in the (PDF) for reference.

B. Submittal Procedure – GC's submittals will be reviewed via the construction management software website with the exception of physical samples. The submittals will be posted on the website for the review. Once the submittal review is completed by the GC, the GC will email the reviewed submittal via construction management software to the Architect for review.

1. Submittal Documents to be submitted via the construction management software for the Architect manual upload, including but not limited to:

a. Design Document Submittals
b. Shop Drawings
c. Product Data
d. Warranty and Closeout Documentation

2. Submittals to be physically submitted include, but are not limited to, the following. Note that although these submittals are handled physically, their status will be tracked within the construction management software:

a. Product finishes and color selection samples
b. Product finishes and color verification samples
c. Finish/color boards
d. Physical samples of materials

3. Administrative Submittals to be created and submitted using the construction management software include but are not limited to:
   a. List of product substitutions.
   b. List of contact personnel.
   c. Notices for roadway interruption, work outside regular hours, and utility cut over's.
   d. Plans for safety, demolition, environmental protecting, and similar activities.
   e. Quality Control Plan(s).
   f. Daily Photographs.

4. Compliance Submittals to be created and submitted using the construction management software include but are not limited to:

   a. Field Test Reports
   b. Quality Control certifications
   c. Manufacturer's documentation and certifications for quality of products and materials provided.
   d. Record and Closeout Submittals

C. Plans and Specifications along with Architects forms (APR's, ASI, and CCDs) will be distributed via email from the construction management software website. These documents will be openly available in a shared folder under the documents tab on the website to all contractors and Suppliers.

1.03 COSTS

A. All costs of construction management software services, throughout the complete project, will be included in the Bid Price.

1.04 AUTOMATED SYSTEM NOTIFICATION

A. Review comments made (or lack thereof) by any party via the construction management software shall not relieve the GC from compliance with requirements of the Contract Documents. The GC is responsible for managing, tracking and documenting the Work to comply with the requirements of the Contract Documents. Owner and Architect acceptance/review acknowledgement via automated system notifications extends only to the face value of the submitted documentation in question and constitutes validation of the GC's specific submitted information only.

END OF SECTION

SECTION 01 32 00 – SCHEDULES AND REPORTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The work under this Contract will be planned, scheduled, executed and reported pursuant to the provisions of Article 4.10 of the General Conditions CONTRACTOR'S CONSTRUCTION SCHEDULE, and Article 4 of the Owner-Contractor Agreement ("Time and Commencement and Substantial Completion").

B. If the Contractor should desire or intend to complete the Work earlier than any required Milestone or Completion date, the Owner or Architect not be liable to the Contractor for any costs or other damages should the Contractor be unable to complete the Work before this earlier date. The duties, obligations and warranties of the Owner to the Contractor shall be consistent with and applicable only to the completion of the Work on the Milestone and Completion dates required in the Owner-Contractor Agreement, unless Owner and the Contractor otherwise agree in writing.

1.02 CONSTRUCTION SCHEDULE - BAR CHART

A. The Construction Schedule shall be in the form of a bar chart and shall consist of horizontal lines, or bars, plotted along a daily time scale. The time-scale shall indicate all required Milestone and Completion dates as set forth in the Owner-Contractor Agreement. The horizontal bar(s) shall indicate the start and finish dates as well as the total time period of performance for each activity. The Contractor shall arrange the chart so as to show the activities which are necessary to fulfill each and every Milestone and Completion date requirement.

1.03 POST AWARD ACTIVITIES

A. The Contractor shall perform the following immediately after receipt of the Notice to Proceed:

1. Prepare a detailed Construction Schedule that represents the Contractor's best judgment on how he shall prosecute and complete the Work in compliance with the Contract Milestone Dates and any Specific Dates stipulated in the Supplementary Conditions.

B. Within (10) calendar days following Notice to Proceed, submit to the Owner and Architect a draft of the Construction Schedule for review and comment. Before the first Application for Payment, the Contractor shall submit to the Owner and Architect a Schedule of Values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Owner and Architect may require. This schedule, unless objected to by the Owner or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

C. The Construction Schedule shall indicate completion date for the project that is not later than the project's required completion date. All activity durations shall be given in calendar days.

D. It is to be understood and agreed by the Contractor is an estimate to be revised from time to time as progress proceeds, and that the Owner does not guarantee that Contractor can start work activities on the start dates or complete work activities on the finish date shown in the schedule, or as same may be updated or revised; nor does the Owner guarantee that Contractor can proceed at all times in the sequence established by said schedule.

E. The Owner and Architect will review the Contractor's Schedule. If required, a meeting will be held between the Owner and the Contractor to resolve any conflicts between the Contractor's schedule and the overall Project Construction. The Contractor shall revise his schedule as required by the Owner to support the Project Construction and shall submit his revised schedule to the Owner and Architect within five (5) days for final review and approval.

F. The Contractor is required to adhere to the Milestone Dates as set forth in the Bid Form.

1.04 RECOVERY SCHEDULE

A. Should any conditions exist, such that certain activities shown on the Contractor's Detailed Construction Schedule fall behind schedule to the extent that any of the mandatory Milestone Dates or Completion Dates are in jeopardy, the Contractor shall be required to, at no cost to the Owner, prepare and submit to the Owner and Architect, a supplementary Recovery Schedule, in a form and detail appropriate to the need, to explain and display how he intends to reschedule those activities to regain compliance with the Detailed Construction Schedule during the immediate subsequent pay period.

B. The Contractor, Owner and Architect shall do the following after determination of the requirement for a Recovery Schedule:

1. Within three (3) calendar days, the Contractor shall present to Owner and Architect the Recovery Schedule. The Recovery Schedule shall represent the Contractor's best judgment as to how he shall reorganize his work so that he may return to the approved Construction Schedule within the immediate subsequent pay period. The Recovery Schedule shall be prepared to a similar level of detail as the Construction Schedule.

C. Five (5) calendar days prior to the expiration of the Recovery Schedule, the Owner, Architect and the Contractor will meet at the job site to determine whether the Contractor has regained compliance with the Construction Schedule. At the direction of the Owner, one of the following will happen:

1. If, in the opinion of the Owner, the Contractor is still behind schedule, the Contractor in conjunction with the Owner and Architect will prepare another Recovery Schedule, at the Contractor's expense, pursuant with 2.02 (B) of this Section, to take effect during the immediate subsequent pay period.
2. If, in the opinion of the Owner, the Contractor has sufficiently regained compliance with the Construction Schedule, the use of the Construction Schedule will be resumed.

1.05 FLOAT TIME

A. Float or slack time is not for the exclusive use or benefit of either the Contractor or the Owner. Contractor's work shall proceed according to start dates, and the Owner shall have the right to reserve and apportion float time according to the needs of the project. The Contractor acknowledges and agrees that actual delays, effecting paths of activities containing float time, will not have any affect upon Contract Completion times, providing that the actual delay does not exceed the float time associated with those activities.

B. Extensions of time will be granted only to the extent that the activity or activities affected exceed the total float or slack along the path of activities affected at the time of Notice to

Proceed of a Change Order or the commencement of any delay or condition for which an adjustment is warranted under the Contract Documents.

1.06 COORDINATION

A. The Contractor shall coordinate his work with activities of the Owner and shall cooperate fully with the Owner in maintaining orderly progress toward completion of the work as scheduled. The Owner's decisions regarding priority between the Contractor's work and the activities of the Owner at the site shall be final and shall not be cause for extra compensation or extensions of time, except where extensions of time is granted because of delay for which Contractor is otherwise entitled to an extension of time under the Contract Documents.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Submit to the Architect shop drawings, product data and samples required by Specifications Sections or as specifically requested by Owner or Architect.

B. The Contractor shall prepare and submit with the Construction Schedule, an incorporated schedule listing dates for submission and approval times allowed for all required shop drawings, product data and samples, tied into Construction Schedule with appropriate logic.

1.02 RELATED SECTIONS

A. Section 01 3126: Electronic Management Procedures

B. Section 01 3200: Schedule and Reports

C. Section 01 7800: Contract Closeout: Record Documents

1.03 SHOP DRAWINGS

A. Original drawings, prepared by Contractor, subcontractor, manufacturer, supplier or distributor, which illustrate some portion of the Work showing fabrication, layout, setting or erection details.

B. Shop drawings shall be prepared for this particular project. Drawings prepared specifically for other projects and revised for this project will be rejected.

C. When necessary, base shop and setting drawings upon actual measurements taken at site and other job conditions. Show any variations and revisions to Contract Documents that are necessary for proper installation of work. Fabrication or installation of work shall not be started until shop or setting drawings have been checked and returned with "furnish as submitted" or "furnish as corrected" indicated by Architect.

D. Identify details by reference to sheet and detail numbers shown on Contract Drawings.

E. Submit shop drawings, required by Contract Documents for execution of the Work, to the Architect no later than 15 days prior to contemplated or actual need in shop or at site, and earlier where more time may be required for review and/or procurement by Contractor.

F. Provide shop drawings with cross-reference to drawing and detail numbers on Contract Drawings to facilitate review.

G. Provide shop drawings which demonstrate to Architect that:

1. Contractor understands design concept of certain portions of Work.
2. Equipment and material to be provided meet design and technical requirements of Contract Documents.
3. Methods of fabrication and installation.

H. After review, reproduce and distribute in accordance with Article on Procedures above and for Record Documents described in Section 01 7839.

1.04 PRODUCT DATA

A. Manufacturer's standard schematic drawings:

1. Modify drawings to delete information, which is not applicable to project.
2. Supplement standard information to provide additional information applicable to project.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance chart, illustrations and other standard descriptive data.

1. Clearly mark each copy and identify pertinent materials, products or models.
2. Show dimensions and clearances required.
3. Show performance characteristics and capacities.
4. Show wiring diagrams and controls.

C. Submit product data required by Contract Documents for execution of the Work, to the Architect no later than 15 days prior to contemplated or actual need in shop or at site, and earlier where more time may be required for review.

D. Provide product data with cross-reference to Specifications Section of Project Manual to facilitate review.

E. Provide PDFs of product data to Architect/Engineer via electronic management procedures.

F. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01 7839 - Record Documents.

1.05 SAMPLES

A. Physical examples to illustrate materials, equipment or workmanship and to establish standards by which completed work is judged.

C. Office Samples: Of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of product or material, with integrally related parts and attachment devices.
2. Full range of color samples.
3. Include identification on each sample, with full Project information.
4. Submit samples in ample time for review or selection, as applicable, so as to not delay Work.
5. Take into account delivery time of all manufactured items when submitting samples.

C. Submit samples of size and quantity specified, or, if not specified, of sufficient size and quantity to illustrate functional and aesthetic characteristics of Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

D. Submit samples of finishes from full range of manufacturers' standard colors, or in specified custom colors, textures, and patterns, for Architect's selection.

E. Field Samples:

1. Construct each sample complete, including work of all trades required in finished Work.
2. A copy of each sample shall stay onsite for review by the Architect and Owner.

1.06 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.07 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers' certificate to Architect/Engineer for review, specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.08 REQUIRED SUBMITTAL QUANTITIES TO ARCHITECT AND OWNER

A. Construction Schedule – Provide bond copies on paper no larger than 11x17". Provide one paper copy each to Owner and Architect plus electronic version.

B. Shop Drawings – Provide drawings electronically unless specifically required by Mechanical and Electrical Sections. Submit Shop Drawings in accordance with Section 01 3000 Electronic Management Procedures.

C. Product Data – Submit Product Data in accordance with Section 01 3000 Electronic Management Procedures.

D. Office Samples – See specific section covering product or material.

E. Field Samples – See section covering specific system.

1.09 CONTRACTOR RESPONSIBILITIES

A. Review shop drawings, product data and samples prior to submission. Contractor shall review and verify shop drawings, product data and samples prior to submission to Architect. Submittals will not be reviewed if Contractor has not reviewed and stamped the data for approval.

B. Verify:
   1. Field measurements.
   2. Field Construction criteria.
   3. Catalog numbers and similar data.

C. Coordinate each submittal with requirements of Work and Contract Documents.

D. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect's review.

E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals.

F. Notify the Owner and Architect, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

G. Begin no work which requires submittals until return of submittals with Architect's stamp and initials or signature indicating review.

H. After Architect's review, distribute copies.

1.10 SUBMITTAL REQUIREMENTS

A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for review, for securing necessary approvals, for possible revision and resubmittals and for placing orders and securing delivery. Submission of all shop drawings shall be through the Contractor.

B. Unless otherwise specifically permitted by the Architect, make all submittals in groups containing all associated items. Partial submittals will be rejected, unless prior accommodations have been made.

C. Accompany submittals with transmittal letter, in duplicate, containing:

1. Date
2. Project title and number
3. Contractor's name and address
4. The specification section number of each shop drawing, product data and sample submitted.
5. Notification of deviations from Contract Documents.

D. Submittals shall include a separate cover sheet attached to each copy containing the following information:

1. Date and revision dates
2. Project title and number
3. The name of:
   a. Architect
   b. Contractor
   c. Subcontractor
   d. Supplier
   e. Manufacturer
   f. Separate detailer when pertinent
4. Identification of product or material
5. Relation to adjacent structure or materials
6. Field dimensions, clearly identified as such
7. Specifications section number
8. Applicable standards, such as ASTM number or Federal Specification
9. A blank space, for Architect review stamp
10. Identification of deviations form Contract Documents
11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents.

1.11 RESUBMITTAL REQUIREMENTS

A. Shop Drawings:

1. Revise initial drawings as required and resubmit as specified for initial submittal.
2. Indicate on drawings any changes which have been made other than those requested by Architect.
3. Product data and samples: Submit new data and samples as required for initial submittal.

1.12 ARCHITECT'S DUTIES

A. Review submittals with reasonable promptness as mutually agreeable among the various parties.

B. Review for:

1. Design concept of project.
2. Information given in Contract Documents.

C. Review of separate item does not constitute review of an assembly in which item functions.

D. Affix stamp and initials or signatures certifying the review of submittal.

E. Return submittals to Contractor for distribution.

F. Send copy of reviewed item, to the Owner

G. The Architect or Owner may immediately reject any item without further review if it is not:

1. Accompanied by a transmittal letter containing the required information.
2. Stamped "approved" by the Contractor.

H. The review will be for conformance to the design concept and compliance with information given in the Contract Documents. The Architect will make notations directly on the electronic submittal.

I. The review is intended to foresee unacceptable products and to avoid the possibility of their rejection at the site. The review shall not be construed as:

1. Permitting a departure from the Contract Documents, unless specifically so noted.
2. Relieving the Contractor of the responsibility for errors or omissions.
3. Acceptance of an assembly in which an approved item is a part.
4. Approval of variations from previously approved items.
5. Approval of dimensions.

J. The Architect will review all samples. Such review will be for appearance only. Compliance with all other requirements is the responsibility of the Contractor.

K. Where the Contract Documents require the design of structural, mechanical or electrical systems or components of systems by a supplier, or where a Contractor initiates a change in the design of a system or component thereof, such systems or components shall be designed by a registered professional engineer and all calculations submitted to the Architect for his records, prior to starting fabrication or installation of the Work. The Architect will not be responsible for the designs of such other professional engineers.

1.13 VARIATIONS FROM CONTRACT DOCUMENTS

A. If the Architect determines a variation from the Contract Documents is in the best interest of the Owner, and it does not involve change in the Contract price or item, the Architect with the Owner's concurrence, may permit such variation.

B. Unless the Architect receives immediate written notification, he will assume the Contractor approves any variation shown.

C. If the Contractor fails to mention variations from the Contract Documents, he will not be relieved of the responsibility for executing the Work in accordance with the Contract Documents.

D. When a variation from the Contract Documents is permitted and such variation involves corresponding adjustment in an adjacent or related item, the responsibility for making and paying all costs for such adjustment rests with the Contractor requesting the original variation.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 40 00 – QUALITY REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Quality assurance and control of installation.
2. References.
3. Field samples.
4. Mock-up.
5. Inspection and testing laboratory services.
6. Contractor's inspection and testing responsibilities.
7. Testing laboratory responsibility.
8. Owner's responsibility.
9. Manufacturers' field services and reports.

1.02 RELATED SECTIONS:

A. Section 01 3126 - Electronic Management Procedures.
B. Section 01 3300 – Submittal Procedures
C. Section 01 6600 - Delivery, Storage and Handling.

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturer’s instructions, including each step in sequence.

C. Should manufacturer’s instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 REFERENCES

A. Conform to reference standard by date of issue current on date of Contract Documents.

B. Obtain copies of standards when required by Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification for Architect before proceeding.

D. Contractual relationship of parties to Contract shall not be altered from Contract Documents by mention or inference otherwise in any reference document.

1.05 FIELD SAMPLES

A. Install field samples at site as required by individual specifications Sections for review.

B. Acceptable samples represent acceptable quality level for Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect.

1.06 MOCK-UP

A. Contractor to construct a building mock-up large enough to provide and show all the systems required as noted in individual sections.

1. Roofing – valleys, eaves, fascia, gutters, downspouts and all associated flashings.
2. Windows and Storefronts – attachment methods, sill pans with end dams, flashings.
3. Weather Resistive Barriers – weather resistant barrier attachments, layering, fenestration flashing wraps.
4. Wood and Sheet Metal siding and trim.

B. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

C. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

D. Room Mock-ups: Coordinate installation of materials, products, and assemblies as required in Specification Sections; finish according to requirements. Provide required lighting and any supplemental lighting where required to enable Architect to evaluate quality of the mock-up.

E. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

F. Tests will be performed under provisions identified in this section and individual product sections.

G. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.

H. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been accepted by Architect unless directed otherwise.

1.07 INSPECTION AND TESTING LABORATORY SERVICES

A. Owner will appoint, employ, and pay for services of independent firm to perform inspection and testing.

1.08 CONTRACTOR'S INSPECTION AND TESTING RESPONSIBILITIES

A. Cooperate with independent firm:

1. Furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
2. Provide access to work and manufacturer's operations.
3. Notify Architect and independent firm 24 hours prior to expected time for operations requiring services.
4. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
5. Furnish copies of mill test reports.
6. Furnish casual labor and facilities.
    a. To provide access to work to be tested.
    b. To obtain and handle samples at site.
    c. To facilitate inspections and tests.

d. For laboratory's exclusive use for storage and curing of test samples.

7. Arrange with laboratory and pay for additional samples and tests required for Contractor's convenience.

B. Re-testing:

1. Re-testing required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Architect.
2. Should initial tests indicate non-compliance with Contract Documents, costs for both initial tests and subsequent re-testing occasioned by non-compliance, and all other related costs, including additional Architect's services made necessary by such failure will be charged to Contractor by deducting such costs from Contract Sum/Price.

C. Notification: Contractor shall notify Testing Lab, Owner and Architect a minimum of 24 hours in advance of any operations scheduled for inspection and/or testing specified herein, to allow for laboratory assignment of personnel and scheduling of test. Work requiring inspections and testing by testing laboratory will not be performed without their qualified technician on the job site. If, after giving notice to the testing lab, the work requiring inspection and/or testing is not performed and the testing lab must make a second trip to the job site, the Contractor shall reimburse Owner for technician’s time and travel expense. Where tests are required prior to Contractor starting work, Contractor shall arrange for testing far enough in advance so as not to delay the project or cause inconvenience to the testing lab.

D. Contractor's Responsibility: The testing laboratory service provided by the Owner shall not relieve the Contractor of his responsibility for compliance with the requirements of the Contract Documents. Testing laboratory services are provided for the sole and exclusive benefit of the Owner in monitoring the quality and performance of the Contractor's work. Results of tests made by the Owner's testing laboratory will be made available to the Contractor and shall be a basis for rejection of non-conforming or defective work. Additional tests/inspections required by the Owner shall not be the basis for any claim by the Contractor for additional compensation.

1.09 TESTING LABORATORY RESPONSIBILITY

A. General: Testing laboratory shall inspect, test and document work performed on this project as described hereinbefore.

B. Test Reports: Promptly furnish test reports, via email, of materials and work tested to the Owner, Architect, Contractor, and Building Department. Test reports shall include the name of the project, General Contractor, applicable Subcontractor, and Testing Laboratory, the locations, dates, and time samples were taken and tested, type of test, identification of sample, location in which the work sample was taken, record of weather conditions, evaluation of test results, conformance or non-conformance of test results with Contract Documents, name and signature of technician taking sample and performing tests, and any other information required by Architect.

C. Inspection Reports: Furnish inspection reports for each site visit documenting activities, observations, and inspections of work; include observations on weather conditions, time and date, conditions and/or status of the work being inspected, actions taken, and recommendations or evaluation of the work. In addition to written reports, immediately notify Architect and Contractor of any portions of the work found to be in nonconformance with the Contract Documents.

D. Codes: Conform to the requirements of the Oregon Structural Specialty Code (latest edition), Section 306 and other applicable sections and the Oregon Structural Specialty Code standards, and any special requirements of the local Authority Having Jurisdiction (AHJ).

E. Limits of Authority: Testing laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of the Contract Documents.
2. Approve or accept any portion of the work (as relates to the Contractor's obligation to conform to the Contract Documents.)
3. Perform any duties of the Contractor.

1.10 OWNER'S RESPONSIBILITY:

The Owner shall not be held liable for the actions (or lack of action) of the testing laboratory(s). The commencement of work by the Contractor shall indicate his understanding and agreement that all disputes or claims which may develop between the Owner's testing laboratory(s) and the contractor will be resolved directly between those two parties without involvement or responsibility on the part of the Owner, unless prior agreement is made in writing. Contractor shall advise the Owner of faulty inspections or tests performed by the testing laboratory but Owner shall not be held responsible for problems, damages, delays, replacement of defective work, etc. which may occur as result of the testing laboratory(s) faulty work in which case the Contractor's sole recourse shall be against the testing laboratory or other party at fault, but not against the Owner. Nothing in these specifications shall be construed as preventing the Contractor from hiring a separate testing laboratory to perform testing laboratory services, however, the Owner's testing laboratory inspections and tests shall be the basis for acceptance or rejection of the work by the Owner unless such inspection or tests are proven to be in error.

1.11 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. Submit qualifications of observer to Architect 30 days in advance of required observations. Observer subject to approval of Architect and Owner.

B. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.

C. Observers shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit report within 30 days of observation to Architect for review.

PART 2 – PRODUCT - Not Used

PART 3 – EXECUTION - Not Used

END OF SECTION

SECTION 01 42 00 – REFERENCE STANDARDS

PART 1 – GENERAL

1.01 ABBREVIATIONS:

A. Refer to the drawings for list of abbreviations.

1.02 DEFINITIONS:

A. Certain terms used generally throughout the specifications (and drawings) are hereby defined as follows:

1. *Indicated:* A cross reference to details, notes or schedules on the drawings, other paragraphs or schedules in the specifications, and similar means of recording requirements in the Contract Documents. Where terms such as "shown", "noted", scheduled", and "specified" are used in lieu of "indicated", it is for the purpose of helping the reader accomplish the cross reference, and no limitation of location is intended except as specifically noted.
2. *Directed, Requested, etc.:* Unless otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required, "accepted", and "permitted" mean "directed by the Architect", "requested by the Architect" , etc. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.
3. *Installer:* The person or entity engaged by the Contractor or his Subcontractor or Sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application, and similar required operations. It is a general requirement that Installers be recognized experts in the work they are engaged to perform.
4. *Approve:* Where used in conjunction with the Architect's or Engineer's response to requests, applications, inquiries, reports, and claims by the Contractor, the meaning of the term "approved" will be held to the limitations of the Architect's responsibilities and duties as specified in the General and Supplementary Conditions. In no case will "approval" by the Architect be interpreted as an assurance to the Contractor that the requirements of the Contract Documents have been fulfilled.
5. *Furnish:* Except as otherwise defined in greater detail, the term "furnish" is used to mean "...supply and deliver to the project site, ready for unpacking, assembly and installation...".
6. *Provide:* Except to the extent further defined, the term "provide" means to furnish and install, complete and ready for the intended use.
7. *Guarantee and Warranty:* "Warranty" is generally used in conjunction with products manufactured or fabricated away from the project site, and "guarantee" is generally used in conjunction with units of work which require both products and substantial amounts of labor at the project site. The resulting difference is that warranties are frequently issued by manufacturers and frequently supported (partially) by product guarantees from manufacturers.

1.03 DRAWINGS, DIMENSION, AND MEASUREMENTS:

A. Where on any of the drawings a portion of the work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to all other portions of the work.

B. Wherever a detail is referenced and developed for a specific condition, same or similar detail shall apply to identical or similar conditions elsewhere on project even though not specifically referenced.

C. Where the word "similar" occurs on the drawings, it shall be interpreted in its general sense and not as meaning identical, and all details shall be worked out in relation to their location and their connection with other parts of the work.

D. The figured dimensions on the drawings or noted indicating dimensions shall be used instead of measurements of the drawings by scale, and shall be strictly complied with.

E. No scale measurements shall be used as a dimension to work with except on "full size" drawings not dimensioned.

1.04 SPECIFICATION EXPLANATION:

A. The specifications are divided into Divisions and Sections for the convenience of writing and using. The titles of these are not intended to imply a particular meaning nor to fully describe the work of each division or section, and are not an integral part of the text which specifies the requirements. The Architect is not bound to define the limits of any subcontract, and will not enter into disputes between the Contractor and his employees, including subcontractors.

B. These specifications are of the abbreviated, or "streamlined" type, and include incomplete sentences.

C. Omissions of words or phrases such as "the Contractor shall" "in conformity therewith", "shall be", "as noted on the drawings", "according to the plans", "a", "an", "the", and "all" are intentional.

D. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

SECTION 01 45 10 – QUALITY CONTROL

PART 1 – GENERAL

1.01 PRELIMINARY WORK

A. Prior to the start of and during the course of the Work (above and below ground) the Contractor shall make a thorough survey of the entire work site to determine all potential hazards. Workmen shall be made aware of those hazards and shall be instructed in procedures and the use of equipment for their protection. The Contractor shall verify the location and condition ("live" or "dead") of all utilities on and near the work site and take precautions to protect his employees, the general public, and the property.

1.02 IMMINENT DANGER

A. The Contractor shall be wholly responsible for any accidents (including death) occurring at any time during the progress of the work and until the final acceptance of the work by the Owner which may happen to any of his workmen or those of any Subcontractor employed on the building or the Owner, Architect and their representatives, or for any damage or injuries (including death) which his work and operations may cause to the work being constructed, or to existing buildings, or to any tenants and occupants of the property, or of the adjoining properties, or to the public or to any public or private property.

1.03 SAFETY

A. The Contractor shall ensure that all employees, visitors, subcontractor's employees, and suppliers' employees, while on the work site, comply with the requirements of OSHA, these requirements and the safety precautions contained in the several Specifications Sections. The Contractor shall promptly and fully comply with, execute and , without separate charge thereof to the Owner, shall enforce compliance with the Occupational Safety and Health Act requirements.

B. The Contractor shall immediately advise the Owner of inspections conducted by OSHA, at the work site, and shall transmit copies of citations and violations to the Owner and Architect.

1.04 SAFETY RESPONSIBILITIES

A. Contractor shall be responsible for:

1. Ensure compliance with these requirements, OSHA requirements, and other safety requirements.
2. Authorize immediate action to correct substandard safety conditions.
3. Review and act to ensure compliance with safety procedures with his supervisors, subcontractors, and suppliers.
4. Make through daily safety inspections of the work site and immediately act to eliminate unsafe acts and unsafe conditions.
5. Investigate work-site accidents and recommend immediate corrective action.
6. Assist in the preparation of accident investigation and reporting procedures.
7. Be responsible for the control, availability, and use of safety equipment, including employee personal protective equipment.

1.05 REQUEST FOR VARIANCES

A. Requests for variances to deviate from OSHA requirements must follow the current established procedures by that Agency.

1.06 FAILURE TO COMPLY

A. If the project is shut down due to the Contractor's failure to comply with the requirements of OSHA or other applicable safety requirements, no part of the time loss due to any such suspension of operations or stop orders shall be made the subject of a claim for extension of time or for increased cost or damage by the Contractor.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 50 00 – TEMPORARY FACILITIES & CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water and sanitary facilities.
2. Temporary Controls: Barriers, enclosures and fencing, protection of the Work and water control.
3. Construction Facilities: Access roads, parking, progress cleaning, and temporary buildings.
4. Removal: Utilities, facilities, and controls.

1.02 RELATED SECTIONS:

A. Section 01 5526: Traffic Control.
B. Section 01 7413: Final Cleaning.

1.03 TEMPORARY UTILITIES

A. Temporary Electricity:

1. Owner will provide electrical services from existing facilities.
2. Furnish and install as necessary temporary wiring, associated equipment and special power needs. Upon completion of the work, remove all temporary wiring and equipment.
3. Furnish and install additional power distribution cords, area distribution boxes so located that the individual trades may use their own construction-type cords to obtain power and provide artificial lighting at all points where required by inspectors and for safety.
4. Ascertain where electrical service is available; provide required connections and extend system to work area as required.
5. Periodic lack of electrical power to all or portions of the building shall not be an allowable reason for schedule delay.

B. Temporary Lighting:

1. Provide and maintain lighting for construction operations to achieve minimum lighting level of 15-foot candles. Provide additional lighting for finish work where and when needed, or as required by the Contract Documents.
2. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails and lamps as required.
3. Maintain lighting and provide routine repairs.

C. Temporary Heat:

1. Provide and pay for heat devices and heat as required to maintain specified conditions for construction operations. Comply with codes, agencies, and regulations regarding usage of temporary space heaters.
2. Use of temporary individual propane heaters are not allowed to dry out or heat the building.

D. Temporary Ventilation:

1. Ventilate enclosed areas to:

a. Assist cure of materials.
b. Dissipate humidity.
c. Prevent accumulation of dust, fumes, vapors, or gases.
d. Provide local exhaust ventilation to prevent harmful dispersal of hazardous substances into atmosphere at all times.

E. Temporary Telephone and Internet Service:

1. Provide telephone and internet service to field office at time of project mobilization.
2. Maintain services from start of work through building occupancy.

F. Temporary Water Service:

1. Water service will be available for contractor's use at the building site. Contractor shall be prudent about use and coordinate with building managers. Contractors are required to provide their own means of water distribution to suit their requirements.
2. Do not allow existing or new drains to become clogged with construction debris, plaster, paint, glues or other substances – either during the demolition phase or the new construction phase.
3. Contractor to provide water and water truck for dust control.

G. Temporary Sanitary Facilities:

1. Provide and maintain adequate number of required facilities and enclosures for use of all persons and trades employed on Work during construction period.
a. Toilet facilities.
b. Washing facilities.

H. Temporary First Aid Facilities: Provide adequate first aid facilities for construction personnel.

I. Temporary Fire Protection:

1. Take all precautions to prevent possibility of fire resulting from construction operations. Particularly avoid hazardous accumulations of rubbish and unsecured flammable materials.
2. Provide emergency fire extinguishing equipment of adequate type and quantity, readily available and properly maintained.
3. Keep local Fire Department's telephone number prominently displayed near telephone.

1.04 TEMPORARY CONTROLS

A. Barriers and Fencing

1. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
2. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
3. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

4. Provide temporary commercial grade chain link fencing at the limits of construction for the duration of the project, until Project has been accepted or occupied by Owner. Maintain site fencing as needed and equip with vehicular gates with locks.

B. Water Control:

1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
2. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
3. Exercise care in cleaning out equipment, etc., so as to prevent materials from clogging catch basins and yard drains.
4. Maintain during construction and leave all drainage items clean and in proper working condition.
5. Maintain public streets daily. Clean and remove any dirt, mud or debris.

C. Pollution Control:

1. Burning or burying of rubbish and waste materials on Site is prohibited. Provide dump box for collection of waste materials.
2. Disposal of volatile fluid wastes (such as mineral spirits, oil or paint thinner) in storm or sanitary sewer systems is prohibited.
3. Keep Site and surrounding areas clear of accumulations of waste material and rubbish resulting from operations under this Contract. Remove waste from Site immediately upon completion of Work. Do not allow any debris or rubbish to drift on to play fields or neighboring properties.

E. Construction Waste Management:

1. Prior to the start of construction, submit to the Owner a Construction Waste Management Plan (CWMP) that includes at a minimum:

    a) A listing of materials or material categories that will be generated during demolition and construction and whether materials will be salvaged, recycled, or landfilled.

    b) The processes and procedures that the Contractor will implement to ensure construction waste will be diverted from the landfill to sources for reuse or recycling according to the CWMP.

    c) The records that will be kept tracking quantities by weight of material that is landfilled, salvaged, or recycled.

2. The Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

3. Of the waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills or incinerators shall be minimized, thereby reducing disposal costs.

4. Salvage/Recycle Requirements: Salvage and recycle as much non-hazardous demolition and construction waste as possible.

F. Protection of Installed Work:

1. Protect installed Work and provide special protection where specified in individual specification Sections.
2. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.
3. Provide and maintain temporary shoring and lateral bracing of structure during erection to resist all loads including:
   a. Wind
   b. Seismic
   c. Construction
   d. Materials
   e. Moving equipment
4. Do not remove temporary bracing and shoring until adequate permanent connections or structural elements are in final position and positively anchored.
5. Provide protective coverings at walls, projections, jambs, sills and soffits of openings
6. Protect finished floors, stairs and other surfaces from traffic, dirt, wear, damage or movement of heavy objects, by protecting with durable sheet materials such as Tyvek.
7. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
8. Prohibit traffic from landscaped areas.

G. Vegetation Damage Control:

1. Protect all existing trees and vegetation to remain on site from foliage, trunk, and root damage.
2. Provide barricades and maintain same around all trees, shrubs or other landscaped areas adjacent to work of this Contract to protect such areas from damage of any nature caused by construction operations.
3. Replace any plantings damaged or destroyed with plants of equivalent size, type and nature as approved by Architect.

H. Exterior Enclosures:

1. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection of Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons.
2. Provide access doors with self-closing hardware and locks.
3. Provide temporary roofing as required.

I. Interior Enclosures:

1. Provide temporary partitions and ceilings as required to separate work areas from owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

2. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces in accordance with ASTM E90 (maximum Flame Spread Rating of 75) and in accordance with ASTM E84.

J. Security:

1. Provide security and facilities to protect Work from unauthorized entry, vandalism or theft.
2. Provide temporary locks at all exterior doors after building is enclosed.
3. Coordinate with Owner's Security program.

1.05 CONSTRUCTION FACILITIES

A. Access Roads

1. Construct and maintain temporary access to public thoroughfares to serve construction area.
2. Relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
3. Provide and maintain access to fire hydrants, free of obstructions.
4. Provide means of removing mud from vehicle wheels before entering streets. Any dirt, mud or other debris tracked onto streets must be removed immediately.
5. Provide barricades, warning signs, flagmen or other traffic regulators which may become necessary for protection of public, construction personnel and property.

B. Parking:

1. Arrange for temporary parking areas to accommodate construction personnel, project visitors and Owner's Employees.
2. When site space is not adequate, provide additional off-site parking as allowed by the local jurisdiction.
3. Do not allow construction personnel vehicle or equipment parking on existing pavement.
4. Designate adequate parking spaces for the Owner and Architect and their representatives during on-site visits.

C. Project Identification:

1. Provide one 4 x 8 foot project sign of MDO exterior grade plywood and wood frame construction, painted with exhibit lettering by professional sign painter to Architect's design and colors. Design supports, framing and surfaces to resist a minimum of 50 mph wind velocity.
2. List title of project and logo, names of Owner, Architect, and Contractor as defined by the Architect's design.
3. Erect on the site at location established by the Construction Program Manager.
   a. Comply with requirements of authorities having jurisdiction.
   b. Obtain and pay for any required permits.
4. No other signs will be allowed without the Owner's permission except those signs required by law.

D. Field Offices and Sheds:

1. General: Furnish and install field office building(s) adequate in size and accommodation for all Contractor's offices, job site meetings, superintendent's office, supply room and tool room.
2. The Contractor will provide a conference room (200 square feet minimum) in Contractor’s trailer or in a separate job site trailer for use by the Architect and Owner and may be used to conduct job meetings.
   For the duration of the project construction (Substantial Completion), provide this office and conference space with:
   a. Adequate light, heating, air conditioning, ventilation and 110V electrical service.
   b. A conference room table with 12 chairs, one 4' x 8' white marker board.
   c. Weekly clean trailer.
   d. Contractor's copy machine.
3. The above referenced facilities shall be completed in total and fully operational for use not later than ten (10) days after mobilization by the Contractor.
4. Sheds: Provide the following facilities in temporary buildings used for material and equipment storage:
   a. Ventilation: Where required for materials being stored.
   b. Fire Extinguisher: One ABC type portable fire extinguisher.
   c. Temperatures: As required for materials being stored.

E. Temporary Vertical Transportation:

1. Provide and maintain all essential temporary vertical transportation for use of all persons and trades employed on Work during construction. Be responsible for all costs incurred.

1.06 AIR QUALITY DURING CONSTRUCTION

A. HVAC Protection

1. Protect all air handling and distribution equipment, and air supply and return ducting during construction.
2. Adequately cover and protect all exposed air inlets and outlets openings, grilled, ducts, plenums, etc. to prevent water, moisture, dust, and other contaminate intrusion.
3. Apply protection immediately after installation of equipment and ducting.
4. Ducting runs that require more than a single day to install be protected at the end of each day's work.

B. Source Control

1. Protect stored on-site or installed absorptive or porous materials such as batt insulation and drywall from exposure to moisture.
2. Provide adequate ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in s secure, dry, well-ventilated space free from strong contaminant sources and residues. Do not ventilate within limits of Work unless otherwise approved by the Architect.

C. Housekeeping

1. Minimize accumulation of dust, fumes, vapors, or gases in the building.

2. Suppress dust with wetting agents or sweeping compounds.
3. Clean-up dust using a wet rag or damp mop.
4. Increase the cleaning frequency when dust build-up is noted.
5. Remove spills or excess applications of solvent-containing products as soon as possible. Remove accumulated water and keep work areas as dry as possible.
6. Vacuum using HEPA filtered vacuum cleaners.
7. Store volatile liquids, including fuels and solvents, in closed containers and outside of the building when not in use.
8. Keep volatile liquid containers closed when the container is inside the building and not in use.

1.07 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore Owner's property, and adjacent private and public property damages or used during construction, to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 55 26 – TRAFFIC CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION OF THE WORK

A. The Contractor shall retain the responsibility for the traffic operations. The Contractor shall cooperate with the Owner so that traffic flow is least impeded by the execution of the work under this Contract. In the event of conflict, the Owner shall be the sole judge of the adequacy of the Contractor's protective measures to assure the flow of traffic.

B. The Contractor understands the special requirement of maintaining the Site and surrounding Facilities in full operation concurrent with the construction activity, and shall provide continuous and safe access by the Owner to all areas of the site not specifically designated for work by the contractor. The Contractor's access shall be limited to the work, staging, delivery and parking areas indicated on the drawings unless otherwise authorized by the Owner.

C. Whenever the contractor's activity affects vehicular or pedestrian traffic the Contractor shall install and maintain lighted barriers, signals, separators, etc. for the safety of the public.

1.02 SUBMITTALS

A. Prior to starting any work the contractor shall submit to the Owner and Architect a detailed plan of his proposed method for controlling traffic. The proposed traffic control plan shall show and describe the proposed locations and time durations covering the following:

1. Vehicular traffic routing.
2. Traffic blockage anticipated to be caused by the work under this Contract.

1.03 TRAFFIC MAINTENANCE FACILITIES

A. Other than as shown on the approved traffic control plans, at no time shall the contractor's operations interfere with the safe and orderly operation of Owner occupied areas of the facility or the neighborhood. Encroachment by the Contractor's operations will not be permitted.

B. For the duration of the Contract, the Contractor shall immediately repair or replace any and all appurtenances damaged or destroyed in the performance of work included herein.

C. Upon completion of the work, temporary traffic maintenance items furnished by the contractor shall remain his property and shall be removed from the site by the Contractor.

D. The Contractor shall utilize water application or other methods approved by the Oregon Department of Environmental Quality to control dust on access streets and the project site to the satisfaction of the Owner and Architect. Power sweepers shall be used to clean streets of dirt along haul routes.

PART 2 – PRODUCTS - Not Used

PART 3 – EXECUTION - Not Used.

END OF SECTION

SECTION 01 66 00 – DELIVERY, STORAGE & HANDLING

PART 1 - GENERAL

1.01 REQUIREMENTS

A. Provide for expeditious transportation and delivery of products to project site undamaged, on a schedule to avoid delay of the work.

B. Provide equipment and personnel at the site to unload and handle products in a manner to avoid damage to products.

C. Provide secure storage and protection for products to be incorporated into the work, and maintenance and protection for products after installation and until completion of the work.

1.02 ENERGY & ENVIRONMENTALLY SENSITIVE PRODUCTS

A. Prior to installation, Contractor shall submit MSDS (Material Safety Data Sheets) for all Paint, Adhesive, Sealant, Plywood, Particle Board, Carpet and other products which could negatively impact the Project environment. Only those products that satisfy the Sustainable Design Requirements may be used in the Project Work.

1.03 DELIVERY

A. Arrange deliveries of products in accord with construction schedules and in ample time to facilitate inspection prior to installation.

B. Coordinate deliveries to avoid conflict with work and conditions at site.

1. Work of other contractors, or Owner.
2. Limitations of storage space.
3. Availability of equipment and personnel for handling products.

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

D. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.

E. Immediately upon delivery, inspect shipment to assure:

1. Product complies with requirements of Contract Documents and reviewed submittals.
2. Quantities are correct.
3. Containers and packages are intact, labels are legible.
4. Products are properly protected and undamaged. Minor damages may be repaired, provided the finish items are equal in all respects to new work.

1.04 PRODUCT HANDLING

A. Provide equipment and personnel necessary to handle products, including those provided by Owner, by methods to prevent soiling or damage to products or packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring, or otherwise damaging products or surrounding surfaces.

C. Handle products by methods to prevent bending or overstressing.

D. Lift heavy components only at designated lifting points.

1.05 STORAGE

A. Store products immediately on delivery, and protect until installed in the work. Store in accord with manufacturer's instructions, with seals and labels intact and legible.

B. Store products subject to damage by elements in substantial weather-tight enclosures.

1. Maintain temperatures within ranges required by manufacturer's instructions.
2. Provide humidity control for sensitive products, as required by manufacturer's instructions.
3. Store unpacked products on shelves, in bins, or in neat piles, accessible for inspection.

C. Exterior Storage:

1. Provide substantial platforms blocking, or skids to support fabricated products 4" above ground, prevent soiling or staining.
2. Cover products, subject to discoloration or deterioration from exposure to the elements, with impervious sheet coverings. Avoid use of non-vented plastic or canvas shelters that could create humidity chambers. Provide adequate ventilation to avoid condensation.
3. Store loose granular materials on solid surfaces such as paved areas, or provide plywood or sheet materials to prevent mixing with foreign matter.

a. Provide surface drainage to prevent flow or ponding of rainwater.
b. Prevent mixing of refuse or chemically injurious materials or liquids.

D. Arrange storage in manner to provide easy access for inspection.

1.06 MAINTENANCE OF STORAGE

A. Maintain periodic system of inspection of stored products on schedules basis to assure that:

1. State of storage facilities is adequate to provide required conditions.
2. Required environmental conditions are maintained on continuing basis.
3. Surfaces of products exposed to elements are not adversely affected. Any weathering of products, coatings, and finishes is not acceptable under requirement of Contract Documents.

1.07 PROTECTION AFTER INSTALLATION

A. Provide protection of installed products to prevent damage from subsequent operations. Remove when no longer needed, prior to completion of work.

B. Control traffic to prevent damage to equipment and surfaces.

C. Provide coverings to protect finished surfaces from damage.

1.08 DAMAGED PRODUCTS

A. Damaged or deteriorated materials shall be removed from the premises. Replace materials that have been damaged.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 71 23 – CONSTRUCTION STAKING

PART 1 GENERAL

1.01 CONTRACT CONDITIONS

A. Work of this Section is bound by the General Conditions, Supplementary Conditions, and Division 1 bound herewith in addition to this Specification and accompanying Drawings.

1.02 WORK INCLUDED

A. Provide survey work by an Oregon State registered land surveyor for the execution of Project.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 7839, Project Record Documents.

1.04 QUALITY CONTROL

A. Before starting work, the Contractor shall locate all general reference points. The Contractor shall employ a registered surveyor (licensed by the State of Oregon) to perform such work. The Contractor shall take such steps as are necessary to prevent the dislocation or destruction of the reference points, and shall be responsible for the accuracy of the site and building layout and elevations for the work.

1.05 SURVEY REFERENCE POINTS

A. Existing Points: See Drawings.
B. Locate existing points prior to starting site work, and preserve during construction.
C. Make no Changes to existing points without Owner and Architect approval.
D. Notify Owner and Architect when any point is lost, destroyed or requires relocation.

1.06 PROJECT LAYOUT

A. Establish existing control points.
B. Record benchmark locations with horizontal and vertical dimensions on Project Record Drawings.
C. Using survey instruments, establish lines and levels for the following:
    1. Stakes for grading, fill, and all earthwork.
    2. Building foundation, floor elevations and similar elements.
D. Re-establish control points as required due to construction activity.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 01 73 29 – CUT & PATCH

PART 1 – GENERAL

1.01 DEFINITION

A. "Cutting and Patching" is defined to include the cutting and patching of nominally completed concrete, steel, wood and miscellaneous metal structures; piping and pavement, in order to accommodate the coordination of WORK, or the installation of other facilities or structures or to uncover other facilities and structures for access or inspection, or to obtain samples for testing, or for similar purposes.

B. SECTION INCLUDES

1. Provide cutting, fitting and patching. The following are included:
    a. Make component parts fit together.
    b. Uncover work to provide for installation of out-of-sequence work.
    c. Remove and replace new work not conforming to Project requirements.
    d. Provide penetrations of nonstructural surfaces for installation of electrical conduits, plumbing, ductwork and other penetrations.
    e. Restore the integrity of fire rated construction at cutting and patching work.

1.02 RELATED SECTIONS

A. Section 01 1000: Summary of Work

B. Individual Specifications Sections:

1. Cutting and patching incidental to work of the Section.
2. Advance notification to other Sections of openings required in work of those Sections.
3. Limitations on cutting structural members.

1.03 SUBMITTALS

A. Submit written request for cutting approval to Architect well in advance of any cutting which affects:

1. Work of Owner or any separate Contractor.
2. Structural value or integrity of any completed or existing work.
3. Waterproof value or integrity of any weather-exposed or moisture resistant work.
4. Efficiency, operational life, maintenance, or safety of any completed or existing work.
5. Visual qualities of any sight-exposed work.

B. Request shall include:

1. Project identification.
2. Location and Description of affected work.
3. Necessity for cutting, alteration, or excavation.
4. Effect on Owner's or separate Contractor's work.
5. Effect on structural or weatherproof integrity on completed or existing work.
6. Description of proposed work including:
    a. Extent of cutting, patching, alteration, or excavation.
    b. Trades who will execute work.
    c. Products proposed for use.
    d. Extent of required refinishing.
7. Alternative to cutting and patching.

8. Cost proposal, when applicable.

C. Submit written notice to Owner and Architect designating date and time work will be performed.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Products similar to those specified elsewhere in this Project Manual:

1. Follow those Specifications.

B. Other Products:

1. Follow Architect's instructions.

C. Change in Materials:

1. For any change in materials, submit request for substitution under provisions of Section 01 2500.

PART 3 – EXECUTION

3.01 EXTENT OF WORK

A. Perform all cutting, fitting, and patching, including attendant excavation and backfill, required to complete work or to:

1. Make work fit properly together.
2. Uncover work for installation of ill-timed work.
3. Remove and replace defective work and work not conforming to Contract Documents.
4. Remove samples of installed work for testing.
5. Provide penetrations through non-structural surfaces for mechanical and electrical work.

3.02 EXISTING CONDITIONS

A. Inspect existing conditions and identify work subject to damage or movement caused by proposed cutting and patching.

B. After uncovering work, inspect conditions affecting products installation or performance.

C. Report unsatisfactory and questionable conditions to the Owner and Architect in writing; do not proceed with work until Architect provides further instructions.

D. Beginning of cutting and patching implies acceptance of existing conditions.

3.03 PREPARATION

A. Maintain adequate temporary support necessary to assure structural integrity of affected work; provide devices and methods to protect other portions of project from damage.

B. Protect work exposed by cutting against damage and discoloration.

C. Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

3.04 PERFORMANCE

A. Provide proper surfaces for repairs.

B. Employ qualified installer or fabricator to perform cutting and patching of:

1. Weather-exposed or moisture-resistant surfaces.
2. Sight-exposed finished surfaces.

C. Restore cut or removed work with new products to provide work complete in accordance with Contract Documents. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated material, full thickness of the construction element. Provide required fire-resistant rating.

D. Fit work air-tight to pipes, sleeves, ducts, conduits, and other surface penetrations.

E. Where patching occurs, refinish entire surface to provide even finish to match adjacent work as follows:

1. Continuous surfaces: refinish to nearest intersection.
2. Assemblies: refinish entire un

3.05 CUTTING STRUCTURAL FRAMING

A. Exposed members, including any columns and posts:

1. Not permitted, unless shown on Drawings or otherwise approved.

3.06 CLEANING AND REPAIRING

A. Including work of other Sections, clean, repair, and touchup, or replace when directed, products which have been soiled, discolored, or damaged by work of this Section.

B. Remove debris from Project Site upon work completion or sooner, if required by Owner.

END OF SECTION

SECTION 01 74 13 - CLEANING

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Work included: Throughout the construction period, maintain the project site where work is carried out in a standard of cleanliness as described in this section.

B. Related work described elsewhere: In addition to standards described in this Section, comply with all requirements for cleaning as described in other various Sections of these Specifications.

1.02 QUALITY ASSURANCE

A. Inspection: Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.

B. Codes and Standards: In addition to the standard described in this section, comply with all pertinent requirements of governmental agencies having jurisdiction.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS AND EQUIPMENT

A. Provide all required personnel, equipment, and materials needed to maintain specified standard of cleanliness.

PART 3 EXECUTION

3.01 PROGRESS CLEANING

A. General:

1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
3. Provide adequate storage for all items, awaiting removal from the job site, observing all requirements for fire prevention and protection of the ecology.
4. Comply with the cleaning requirements of other sections in the Project Manual.
5. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed and remote spaces prior to enclosing the space.
6. Broom and vacuum clean interior areas prior to the start of surface finishing and continue cleaning to maintain a dust-free space during the finishing operations.
7. Prior to painting, remove all dust accumulation on walls.

B. Site:

1. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site; restack, tidy, or otherwise service. All arrangements to meet the requirements of paragraph 3.01, A.1. above.
2. Maintain the site in a neat and orderly condition at all times to the satisfaction of the Construction Program Manager.
3. Remove waste materials, debris, and rubbish from site periodically and dispose off-site.

3.02 DUST CONTROL

A. Maintain continuous cleaning and wetting procedures to control dust pollution at project site and haul routes as required by governing authorities and the Contract Documents. Use power sweepers for street cleaning as necessary. Maintain dust control operations to prevent flying dust from leaving the project site.

B. Schedule cleaning so that resultant dust and contaminants will not fall on wet or newly coated surfaces.

C. Erect dust proof barriers at the interior of building to control the spreading of construction generated dust and debris to areas of the building not affected by renovation work.

D. Provide dampened or tacky walk-off mats at dust proof barriers that are also used to access other areas of the building to prevent tracking of dust and debris to areas of the building not affected by renovation work. Provide progress cleaning as required.

3.03 CLOSEOUT CLEANING

A. Closeout cleaning shall be limited to those areas in which construction occurred and also the on-site sanitary facilities used by the contractor.

B. Provide final cleaning of Work prior to Substantial Completion and Architect's "Punch List." Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to condition expected from normal commercial building cleaning and maintenance program. Comply with manufacturer's recommendations. Complete following cleaning operations before requesting Owner review for Certification of Substantial Completion:

1. Clean equipment and fixtures to sanitary condition.
2. Replace filters of operating equipment.
3. Clean debris from roofs, gutters, downspouts, and drainage systems.
4. Clean mechanical and electrical equipment and spaces, including tops of pipes, ducts, equipment, etc.
5. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels and other foreign matter from sight exposed interior and exterior surfaces.
6. Hose-clean exterior paved surfaces, rake clean other surfaces of grounds.
7. For all new exterior construction, power wash entire exterior of building to remove all dirt and dust - care shall be taken around new landscaping.
8. Final clean all glazing. Exterior glazing to be cleaned after building is power washed.
9. Re-clean areas or equipment, after final inspection, if dirtied as result of Contractor's work in preparing for final inspection or completion of punch list.
10. Restore landscape damaged as a result of construction of this project including removal of ruts caused by vehicle traffic, removal of construction debris, replacement of damaged or contaminated soils and mulches, reseeding of damaged lawns, restoration of sidewalks or pathways damaged during construction and other landscaping repairs required as a result of construction activity as directed by the Owner's Representative.

B. Removal of protection: Except as otherwise indicated or requested by Owner, remove temporary protection devices and facilities which were installed during course of Work to protect previously completed Work during remainder of construction period or to protect public.

C. Compliance:

1. Comply with safety standards and governing regulations for cleaning operations.
2. Do not burn waste materials at Site.
3. Do not bury debris or excess materials on Owner's property.
4. Do not discharge volatile or other harmful or dangerous materials into drainage systems.
5. Remove waste materials from Site and dispose of in lawful manner.

END OF SECTION

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

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

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
      e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
   6. Material Reused on Project: Include the following information for each:
      a. Identification of material and how it was used in the project.
      b. Amount, in tons or cubic yards (cubic meters).
      c. Include weight tickets as evidence of quantity.
   7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00 – CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Description of Requirements.
2. Closeout Procedures.
3. Record Document Submittals.
4. Closeout Cleaning.
5. Testing.
6. Operation & Maintenance Instructions.
7. Prerequisites to Substantial Completion.
8. Final Acceptance.
9. Evidence of Payments and Release of Liens.
10. Final Adjustment of Accounts.
11. Submittal of Statement of Compliance.
12. Submittal of Certification of No Asbestos.

1.02 RELATED SECTIONS

A. Section 01 1000 - Summary of Work.

1.03 DESCRIPTION OF REQUIREMENTS

A. Definitions: Project Closeout is the terminology used to describe certain collective project requirements, indicating completion of Work, that shall be fulfilled near end of Contract time in preparation for Final Acceptance and occupancy of Work by the Owner, as well as final payment to Contractor and normal termination of Contract.

B. Time of Contract Closeout is directly related to "Substantial Completion"; therefore, time of closeout may be either single time period for entire Work or series of time periods for individual elements of Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to other provisions of this Section.

1.04 CLOSEOUT PROCEDURES

A. Contractor will initiate the close-out period by providing a written statement to the Owner and Architect stating that the Contract Documents have been reviewed, Work has been inspected and approved by the Contractor, and that Work is complete in accordance with Contract Documents and ready for Architect's review.

B. Provide submittals to Architect that are required by governing or other authorities indicating that all work has been inspected and approved by the appropriate authorities.

C. Submit written request for Final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.05 RECORD DOCUMENT SUBMITTALS

A. Submit Record Documents in accordance with Specification Section 01 7839.

1.06 CLOSEOUT CLEANING

A. Complete closeout cleaning in accordance with Specification Section 01 7413.

1.07 TESTING – Unless specified elsewhere in these specifications, the following testing procedures will be

followed:

A. Operating equipment and systems shall be tested in presence of Owner to demonstrate compliance with specified requirements.

1. Notify Owner, in writing, seven (7) days prior to tests scheduled under requirements of this Section.
2. Testing shall be conducted under specified design operating conditions as recommended or approved by Owner and Owner's Representative.
3. Provide copies of all test reports and records to Owner.

B. All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each subsystem, followed by entire system, followed by inter-ties to other major systems.

C. All special testing materials and equipment shall be provided by Contractor.

D. Owner-Witnessed Contractor's Tests:

1. System shall be checked for proper installation, shall be adjusted, and shall be calibrated to verify that it is ready to function as specified.
2. All system elements shall be checked to verify that they have been installed properly and that all connections have been made correctly.
3. All discrete elements and sub-systems shall be adjusted and shall be checked for proper operation.
4. Operational Tests shall be complete prior to starting Functional Acceptance Tests.
5. Provide copies of all test reports and records to Owner.

E. Owner-Witnessed Functional Tests:

1. Objective of these tests is to demonstrate that system is operating and complying with specified performance requirements.
2. Owner-witnessed Functional Acceptance Test shall be performed on complete system. Each function shall be demonstrated to satisfaction of Owner on paragraph-by-paragraph basis of Contractor's written test procedure, developed to demonstrate conformance to requirements of Contract Specifications.
3. Functional acceptance test shall be witnessed and signed off by Owner upon satisfactory completion.
4. Actual testing program shall be conducted in accordance with prior approved procedures and shall be documented as required hereinafter.
5. Notify Owner at least two weeks prior to date of Functional Acceptance Test.
6. Test systems independent of, and prior to, tie into off-site systems.

F. Performance Period:

1. Upon successful completion of Owner-Witnessed Functional Test, Performance Period (30 consecutive calendar days) shall commence on first day following performance test. This period shall be completed prior to final acceptance of the project. The commencement of the warranty period is scheduled from the beginning date of the performance period which has been successfully completed. In event of failure to meet standard of performance during any initiated performance period, it is not required that one 30-calendar day period expire in order for another performance period to begin.
2. If equipment or system operates so as to demonstrate continuing compliance with

specified requirements for period of 30 consecutive calendars days from commencement date of performance period, it shall be deemed to have met standard of performance. In addition, equipment or systems shall operate in conformance with all Contract Specifications and with Contractor's bid and published Specifications in effect on date Contract is executed, provided such specifications are equal to or better than specifications submitted with Contractor's bid.

3. Equipment shall not be accepted by Owner, and final payment shall not be made by Owner, until standard of performance is met.
4. Systems shall be first tested as independent building systems to meet the building substantial completion requirements followed by successful tests of systems tied into Owner's systems which include but are not limited to, one off-site security/alarm monitoring agency.

G. Test Procedure Development and Test Documentation:

1. Within thirty (30) days after Award of Contract, Contractor shall prepare and submit to Owner's Representative and to Owner for review, detailed descriptions of tests procedures which Contractor proposed to perform to demonstrate conformance of completed systems of instrumentation and controls to these Specifications.
2. Decision of Owner's Representative upon acceptability of test procedures shall be final.
3. Equipment shall not be accepted by Owner, and final payments shall not be made by Owner until standard of performance is met.

H. Operational Tests:

1. Contractor shall prepare checkoff sheet(s) for each system. These checkoff and data sheets shall form basis for these operational tests and this documentation.
2. Each checkoff sheet shall cite following information and shall provide spaces for signoff on individual items and on completed systems by Owner and Owner's Representative.
   a. Project name.
   b. For each element: tag number, description, manufacturer and model number, installation bulletin, and specification sheet number.
3. Each Instrument Calibration sheet shall provide adequate information and space for signoff on individual items and on completed units by Contractor.

1.08 OPERATION & MAINTENANCE INSTRUCTIONS

A. INSTRUCTION OF OWNER'S PERSONNEL

1. After Substantial Completion and prior to Final Inspection or Full Acceptance of the Project, Contractor shall provide qualified personnel for conducting full operation and maintenance training and instructions in the operation, adjustment and maintenance of all operating equipment and systems to Owner's designated personnel; include all general, mechanical and electrical operating systems and equipment. Provide a minimum of 40 hours of such training and instructions, conducted to Owner's satisfaction.
2. Except as otherwise specified, arrange for each installer of work requiring continuing maintenance or operation, to meet with Owner's personnel, at project site, to provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures.
3. Use operating and maintenance manuals as the basis for instruction. Review contents of Manual with personnel in full detail to explain all aspect of operations and maintenance; include as a minimum record documentation, tools, spare parts and materials, lubricants,

fuels, identification system, control sequences, hazards, cleaning and renewal of finishes, and similar procedures and facilities.

4. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds and similar continuing commitments.
5. All equipment operation and maintenance instructions and training shall be video taped by the Contractor and the edited film delivered to the Owner.
6. For additional requirements for operations instruction, see respective Specification Sections.

1.09 PREREQUISITES TO SUBSTANTIAL COMPLETION

A. Complete following before requesting Architect's review for certification of Substantial Completion, either for entire Work or for portions of Work. List known exceptions in request.

1. In progress payment request that coincides with, or is first request following date Substantial Completion is claimed, show either 100% completion for portion of Work claimed as "substantially complete", or list incomplete items, value of incomplete Work, and reason for Work being incomplete.
2. Include supporting documentation for completing Work noted as incomplete as indicated in these Contract Documents.
3. Submit statement showing accounting of changes to Contract Sum.
4. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
5. Deliver tools, spare parts, extra stock of material and similar physical items to Owner.
6. Complete start-up testing of systems, Performance Periods, and instruction to Owner’s operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools and facilities mock-ups and similar elements.
7. Complete final cleanup requirements, including touch-up painting of blemished surfaces.
8. Test fire and life safety systems in presence of Owner, Architect and City/County/State officials.
9. Obtain Approvals as required from Authorities Having Jurisdiction.
10. Complete major punchlist items.
11. Contractor shall submit copy of Contractor's Punchlist to Architect, clearly stating that building is ready for review with exception of items noted in Contractor's Punchlist.

B. Review procedure: Upon receipt of Contractor's request for review, Architect will either proceed with review or advise Contractor of unfulfilled prerequisites.

C. Following initial review, Architect will either prepare Certificate of Substantial Completion or will advise Contractor of Work that must be performed before Certificate will be issued.

D. Results of completed review will form initial "punchlist" for final acceptance.

1.10 FINAL INSPECTION

A. When Contractor considers Work complete, he shall submit written certification that:

1. Contract Documents have been reviewed.
2. Contractor has inspected Work for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.

4. The Project, properties, and streets are finally cleaned of debris and dirt caused by Contractor operations.
5. Work is complete and ready for final inspection.

B. Architect will inspect Work to verify completion status as soon as possible after receipt of Contractor's certification.

C. Should Architect consider Work incomplete or defective:

1. Architect will promptly notify Contractor and Owner in writing, listing incomplete or defective work.
2. Contractor shall immediately remedy deficiencies, and send second written certification to Architect that Work is complete.
3. Architect will reinspect Work.

D. When Architect and Owner find Work acceptable under Contract Documents, they will jointly request Contractor to make closeout submittals.

1.11 REINSPECTION FEES

A. Should Architect or Engineer be required to make more than two Substantial inspections or one Final inspection due to Contractor's failure to correct specified deficiencies, the Contractor shall bear all costs (including compensation for the Architect's, Engineer's, and Construction Program Manager's additional services) made necessary thereby.

1.12 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

A. Contractor shall submit to the Owner the following:

1. Contractor's Affidavit of Payment of Debt and Claims (AIA Documents G706, or similar form approved by the Owner).
2. Contractor's Affidavit of Release of Liens (AIA Documents G706A or similar form approved by the Owner) including the following:
    a. Contractor's Release or Waiver of Liens.
    b. Separate releases or Waivers of Lien for each Subcontractor, supplier, and others with lien rights against Owner's property, together with list of those parties.
3. Consent of Surety to Final Payment. Contractor to provide AIA Document G707 or similar form.

B. Duly sign and execute all submittals, before delivery to Owner.

1.13 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit final statement of accounting to the Owner, including the following:

1. Original Contract Sum.
2. Additions and deductions resulting from:
    a. Previous Change Orders.
    b. Deductions for incomplete Work. (if any)
    c. Deductions for Liquidated Damages. (if any)

d. Deductions for Reinspection Payments (if any)

3. Total Contract Sum, as adjusted.
4. Previous Payments
5. Sum remaining due.

B. The Owner will prepare and issue final Change Order, reflecting approved adjustments to Contract Sum not previously made by Change Orders.

1.14 SUBMITTAL OF STATEMENT OF COMPLIANCE

A. Contractor shall complete and submit the Statement of Compliance form bound herein, prior to Final Payment.

1.14 SUBMITTAL OF CERTIFICATION OF NO ASBESTOS

A. Contract shall complete and submit the Certification of No Asbestos form bound herein, prior to Final Payment.

1.15 FINAL APPLICATION FOR PAYMENT

A. Follow procedures specified in General and Supplementary General Conditions.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

STATEMENT OF COMPLIANCE

No payment shall be made until the Contractor files with the Owner, prior to acceptance of the Work, a notarized Certification of Compliance on this form:

* * * * * * * * * *

The Contractor does hereby certify that all work has been performed and materials supplied in accordance with the drawings, specifications, and Contract Documents for the above Work, and that:

No less than the prevailing rates of wages as ascertained by the governing body of the Contracting agency has been paid to laborers, workers, and mechanics employed on this Work;

There have been no unauthorized substitutes of Subcontractors without the names of the Subcontractors having been submitted to the Owner prior to the start of such subcontracted work;

No subcontract was assigned, transferred, or performed by any Subcontractor other than the original Subcontractor, without prior notice having been submitted to the Owner;

All claims for material, labor, and other services performed in connection with these specifications have been paid;

All monies due to the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund, the State Tax Commission, Hospital Associates, and/or others have been paid.

In WITNESS WHEREOF, the undersigned has signed and sealed this instrument this _____ day of _____,20__.

Firm Name _____

Signature _____

Title _____

(Attest) _____
(SEAL IF BIDDER IS A CORPORATION)

As determined necessary, evidence of compliance may be required to be submitted with and made a part of this Certificate of Compliance.

CERTIFICATION OF NO ASBESTOS

Final payment shall not be made until the Contractor files with the Owner, prior to acceptance of the Work, a notarized Certification of Compliance on this form:

* * * * * * * * * *

"TO THE BEST OF MY KNOWLEDGE, NO ASBESTOS-CONTAINING MATERIAL WAS USED IN THE CONSTRUCTION OF THIS PROJECT. MATERIAL SAFETY DATA SHEETS WILL BE PROVIDED AS REQUESTED BY THE OWNER FOR ALL MATERIALS, WHICH MAY BE QUESTIONED IN THE FUTURE."

In WITNESS WHEREOF, the undersigned has signed and sealed this instrument this _____day of_____, 20___.

Firm Name_____

Signature_____

Title_____

(Attest)_____

(SEAL IF BIDDER IS A CORPORATION)

As determined necessary, evidence of compliance may be required to be submitted with, and made a part of this Certificate.

END OF SECTION

SECTION 01 78 23 – O&M DATA

PART 1 GENERAL

1.01 SUMMARY

A. SECTION INCLUDES:

1. Forms of Submittal
2. Operation Instruction and Maintenance Manual

1.02 RELATED SECTIONS

A. Section 01 7800: Contract Closeout

1.03 GENERAL REQUIREMENTS

A. DESCRIPTION

1. Coordinate related requirements specified in other parts of the Project Manual.
2. Compile product data and related information appropriate for Owner's maintenance and operation.
3. Prepare operating and maintenance data specified in this Section and referenced in other Sections.
4. Prior to Owner's acceptance, instruct Owner's personnel in maintenance, equipment, and systems operation.
5. For additional data requirements see respective Specifications Sections.
6. Operation and maintenance manuals as specified herein, for all equipment for the total Project, shall be submitted per the submittal schedule at the end of this section.

B. FORMS OF SUBMITTALS

1. Prepare data in instructional form for use by Owner's personnel.
2. Format (unless directed by Owner to provide electronically):
   a. Size: 8-1/2" x 11".
   b. Paper: 20 pound minimum, white for typed pages.
   c. Text: Manufacturer's printed data, or neatly type written.
   d: Drawings:
      1) Provide reinforced punched binder tab, bound in with text.
      2) Fold larger drawings to text page size.
   e. Provide fly-leaf for each separate product, or each piece of operating equipment.
      1) Provide typed description of product, and major component parts of equipment.
      2) Provide indexed tabs.
   f. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
      1) Title of Project.
      2) Identity of general subject matter covered in the Manual.
3. Binders:
   a. Commercial quality stiff cover, metal-hinged three-ring binders with durable and cleanable plastic covers; binders shall be Wilson Jones #344 Series or equivalent, as approved by the Owner.
   b. Minimum ring size: 1".

c. When multiple binders are used, correlate data into related consistent groupings.

1.04 OPERATING INSTRUCTIONS & MAINTENANCE MANUALS

A. CONTENTS OF OPERATING INSTRUCTION & MAINTENANCE MANUALS FOR OPERATIONAL EQUIPMENT

1. General: For all operational equipment installed, including general, mechanical and electrical operational equipment, Contractor shall submit operation and maintenance manuals as specified herein. Manuals shall have a neatly typewritten table of contents for each volume, arranged in a systematic order.

a. Contractor, name of responsible principal, address and telephone number.
b. A list of each product required to be included, indexed to content of volume.
c. List, with each project, the name, address and telephone number of:
1) Subcontractor or Installer.
2) Maintenance Contractor, as appropriate.
3) Identify the area of responsibility for each.
4) Local source of supply for parts and replacement.
d. Identify each product by name and other identifying symbols as set forth in Contract Documents.

2. Product Data:
a. Product data shall contain detailed information, where applicable, relative to the following:
1) Equipment functions, operating characteristics, and limiting conditions.
2) Assembly, installation, alignment, adjustment and checking instructions.
3) Operating instructions for start-up, routine and normal operation, regulation and control, shutdown, and emergency conditions.
4) Detailed lubrication and routine and preventative maintenance instruction, including a schedule of recommended checks.
5) List of all parts and components of equipment stating catalog number and size of part used in or on equipment.
6) Safety precautions and safety features.
7) Outline, cross-section and assembly drawings, engineering data, and wiring diagrams.
8) Test data and performance curves.
b. Include only sheet pertinent to specific product.
c. Annotate each sheet to:
1) Clearly identify specific product or part installed.
2) Clearly identify data applicable to installation.
d. Delete references to inapplicable information.

3. Drawings:
a. Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment and system.
b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.

4. Supplement product/installation data with written text:

a. Organize in consistent format under separate headings for different procedures.
b. Provide logical sequence of installations for each procedure.

5. Warranties, Bonds and Service Contracts: Copy of each warranty, bond and service contract issued, signed over to the Owner and exercisable by Owner. Provide information sheet for Owner's personnel indicating:
   a. Proper procedures in event of failure.
   b. Instances which might affect validity of warranties and bonds.
   c. Assemble Warranties and Bond in a separate notebook.
6. Submit 2 copies of complete manual in final form along with electronic format.

B. CONTENTS OF MAINTENANCE MANUALS FOR NON-OPERATIONAL ITEMS
1. Submit 2 copies of complete manual in final form along with electronic format.
2. For all architectural non-operational products, applied materials and finish items installed. Contractor shall submit maintenance manuals as specified herein. Each manual shall contain detailed information, where applicable, relative to the following:
   a. Manufacturer's data, given full information on products.
      1) Catalog number, size, composition.
      2) Color and texture designations.
      3) Information required for re-ordering special manufactured products.
      4) Parts Lists.
   b. Instructions for care and maintenance:
      1) Manufacturer's recommendation for types of cleaning agents and methods.
      2) Cautions against cleaning agents and methods which are detrimental to the product.
      3) Recommended schedule for cleaning and maintenance.
      4) Instructions and recommendations for repair of finish.
3. For additional requirements for maintenance data, see respective Specification Sections.

1.05 SUBMITTALS

A. SUBMITTAL SCHEDULE
1. Submit to the Architect one (1) copy of preliminary drafts of proposed formats and outlines of contents 60 days prior to date of Substantial Completion for each phase of work. Architect will review and return with comments.
2. Submit to the Architect one (1) copy of completed data in final form thirty (30) days prior to date of Substantial Completion, for each phase of work. After review, copy will be returned with accompanying comments.
3. Make corrections based on copy returned and submit specified number of copies of approved data in final form fourteen (14) days prior to Substantial Completion for each phase of work. The Architect will be the sole judge of the completeness of the manual.
4. After receipt of the Architect’s approval, the Contractor shall prepare and transmit to the Owner two (2) final copies of each of the above manuals, along with electronic format, not later than ten (10) days following the receipt of the Architect’s approval.

END OF SECTION

SECTION 01 78 39 – RECORD DOCS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Section 01 3300: Shop Drawings, Product Data, and Samples.

1.02 MAINTENANCE OF DOCUMENTS

A. Maintain at job site, one copy of:
1. Contract Drawings
2. Specifications
3. Addenda
4. Change Orders
5. Requests for Interpretation (RFI's)
6. Requests for Proposal (RFP's)
7. Other Modifications to Contract
8. Field Test Records
9. Truck tickets for all imported material
10. Current Construction Schedule

B. Store Documents in approved location, apart from documents used for construction.

C. Maintain documents in clean, dry, legible condition.

D. Do not use record documents for construction purposes.

E. Make documents available at all times for inspection by Owner and Architect.

F. Record documents must be updated with all required information prior to approval of application for payment.

1.03 RECORDING

A. The Contractor and/or Subcontractors under his direction shall record on set of clean, new prints each and every change that is made from general drawings at time it is made. This includes any changes that are made in partitions, doors, or otherwise in arrangement of construction of buildings as well as a complete record of exact manner in which electrical and mechanical work, piping, etc., are installed. Dimensions shall be included where necessary to accurately locate piping and other items that will be concealed underground or in finished building that may later be necessary to service.

B. Contract Drawings: Legibly mark to record actual construction:
1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
2. Field changes of dimensions and detail.
3. Changes made by Change Order, RFI, and Shop Drawing variations.
4. Details not on original Contract Drawings.

C. Shop Drawings: Not Required.

D. Specifications and Addenda: Legibly mark up each section to record:

1. Changes made by Change Order.
2. Other matters not originally specified.

E. Label each document "PROJECT RECORD" in ½ " high printed letters.

F. Keep record documents current.

G. Do not permanently conceal any work until required information has been recorded.

1.04 SUBMITTAL

A. Upon completion of the Project, and prior to final payment, the Contractor shall submit Project Record Documents to Architect for approval.

B If not approved by Architect, records of changes shall be revised and resubmitted by the Contractor.

C. Accompany submittal with transmittal letter to Architect containing:

1. Date
2. Project title and number
3. Contractor's name and address
4. Title and number of each record document
5. Certification that each document as submitted is complete and accurate.
6. Signature of Contractor, or his authorized representative.

D. Do not use Record Documents for construction purposes. Protect from deterioration and loss.

1. Owner will monitor Record Documents and compare to Contractor's payment application on monthly basis.
2. Up-to-date Record Documents are prerequisite to Final Acceptance and approval of Final Payment Request.

E. Record Drawings:

1. Maintain record set of prints of Contract Drawings and Shop Drawings in clean, undamaged condition. Accurately indicate depth of all concealed mechanical items, buried piping, locations of cleanouts, etc., from walls and centerlines utilizing standard industry practice. Provide to acceptance of the completed project one complete set of construction documents revised to show "As-Installed" conditions, including addenda and change order items.
2. Mark-up set of Record Drawings to show actual installation where installed work varies substantially from work as originally shown.
3. Mark whichever Drawing (Contract Drawings or Shop Drawings), most appropriate and most capable of showing actual "field" condition fully and accurately. Consolidate information on complete systems or units of work on minimum number of Drawing Sheets required to properly document changes.
4. Give particular attention to concealed work that would be difficult to measure and record at later date.
5. Mark record set with red erasable pencil and where feasible, use other color to distinguish between variations in separate categories of Work.
6. Show all backing material and other embedded or concealed items required for installation of future work by Owner.
7. Organize Record Drawing sheets into manageable sets, separated by construction discipline, and bind with durable cover sheet. Print suitable titles, dates and other identification on cover of each set.

D. Record Specifications:

1. Maintain one complete copy of Project Manual, including Specifications and Addenda, and one copy of other written Construction Documents such as change orders, supplemental instructions and similar modifications issued in printed form during construction.
2. Mark these documents to show substantial variations in actual Work performed in comparison with text of Specifications and modifications issued.
3. Note related Record Drawing information and Product Data, where applicable.
4. Upon completion of Work, submit Record Specifications to Owner’s Representative for Owner's records.

E. Record Product Data:

1. Maintain one copy of each Product Data submittal approved for Project.
2. Mark documents to show significant variations in actual work performed in comparison with submitted information.
3. Include both variations in products as delivered to Site and variations from manufacturer's instructions and recommendations for installation.
4. Give particular attention to concealed products and portions of Work which cannot otherwise be readily discerned at later date by direct observation.
5. Note related change orders and markup of product data accordingly.
6. Upon completion of mark-up, and no later than Final Acceptance of the Project, provide written verification that all Record Product Data has been transmitted to Owner’s Representative for Owner's records.

F. Record Sample Submittal:

1. Immediately prior to date or dates of Substantial Completion, Contractor shall meet at Site with Owner to determine which, if any, of submitted Samples that have been maintained by Contractor during progress of Work, shall be submitted to Owner for record purposes.
2. Comply with delivery to Owner's designated location.

G. Miscellaneous Record Submittals:

1. Refer to other Sections of these Specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of work.
2. Immediately prior to date or dates of Substantial Completion complete miscellaneous records and place in good order, properly identified and bound and filed, ready for continued use and reference.
3. Submit for Owner's records.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 90 00 – UTILITY LOCATIONS

PART 1 GENERAL

1.01 DESCRIPTION

A. It is the responsibility of the Contractor to locate and mark all public and private utilities on the project property or public property, prior to commencement of work.

B. Upon notification from any of the public agencies, utilities, or Owner that the Contractor has caused damage to any facility, equipment or installation of the agency or Owner, and the Contractor failed to request a utility locate service from said utility at least two (2) normal business days prior to the damage, or if the locate service was properly requested and the damage was not caused by an error in the locate service, the Owner will withhold from forthcoming or accrued Contract payment, including advances, a sum sufficient to protect the agency of utility from loss.

C. Upon receipt of a release of claim by the notifying utility or upon judgment of a court having jurisdiction in the matter and having established that the contractor is liable for a lesser amount or is not liable for a lesser amount or is not liable for the damage, the Owner will release the excess funds to the Contractor. Funds withheld pursuant to this provision shall not bear interest. Upon receipt of satisfactory evidence against the Contractor in a court of competent jurisdiction within sixty (60) days after discovery of the damage, the Owner shall release the funds withheld pursuant to this provision.

1.02 PROTECTION OF UTILITIES

A. Any pipes or other utilities encountered in the excavation shall be shored up and cared for by the Contractor as to leave them in a proper working condition until such times as the Owner shall determine what shall be done with them.

B. Any utilities mislocated or inadequately located by the appropriate utility company which is damaged by the contractor shall not constitute reimbursement or time extension to the Contractor from the Owner for repair(s) of work that the Contractor performs.

C. No underground utility or structures shall be backfilled until they are inspected and approved by the Owner. The Contractor shall give the Owner twenty-four (24) hours notice of his intention to backfill or cover his work. Any work covered up without approval or proper required inspection shall, upon request of the Owner, be uncovered for inspection at the expense of the Contractor. If the law or ordinance of any public authority requires any work to be tested, approved, or inspected, the Contractor shall arrange an appointment and a fixed date for such inspection.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 91 00 – GENERAL COMISSIONING (Cx)

PART 1 – GENERAL

1.01 SUMMARY

A. Section describes work associated with commissioning of selected systems including commissioning meetings, construction checks, equipment start-up, functional testing, operations and maintenance manuals, and operator training.

B. Work Provided Under Separate Contract: Owner's Commissioning Administrator (CA) will supervise commissioning activities and provide the following commissioning services:
1. Develop commissioning plan.
2. Assist Contractor to incorporate commissioning activities into Project Construction Schedule.
3. Conduct commissioning meetings.
4. Review project submittals.
5. Develop Construction Checklists and Functional Test Plans.
6. Observe Construction checks and start-up of selected equipment.
7. Review testing, adjusting, and balancing (TAB) reports.
8. Supervise and document functional testing.
9. Review O&M manuals and as-built documents.
10. Coordinate operator training.
11. Prepare final commissioning report.

C. Contractor shall provide the following services:
1. Assign individuals representing Contractor and mechanical, electrical, controls, and low voltage subcontractors as members of Commissioning Team.
2. Incorporate commissioning activities in Contractor’s construction schedule.
3. Assist CA in development of Construction Checklists.
4. Execute Construction Checklists.
5. Perform Equipment Start-up.
6. Perform contractor directed verification of automatic controls.
7. Assist CA in development of Functional Test Plans.
8. Assist CA with Functional Testing.
9. Provide Operations & Maintenance documentation.
10. Provide draft and final TAB reports to CA
11. Perform operator training and supervise training performed by manufacturer’s representative.
12. Provide submittals, product data, shop drawings, controls sequences, points list, wiring diagrams, schematics, and design documents and to assist in commissioning documentation development.

D. Contractor shall provide related services as directed, including, but not limited to:
1. Access to the Work
2. Incidental labor, facilities, and equipment to assist CA in conducting commissioning activities.
3. Completion of required submittals.
4. Coordination of Work with activities of CA.

1.02 RELATED SECTIONS

A. 22 08 00 – COMMISSIONING OF PLUMBING

B. 23 08 00 – COMMISSIONING OF HVAC

C. 23 05 93 - TESTING, ADJUSTING, AND BALANCING

D. 26 08 00 – COMMISSIONING OF ELECTRICAL

1.03 DEFINITIONS

A. CA: Commissioning Administrator (CA) is the Individual responsible for supervising commissioning work.

B. Construction Phase Commissioning Plan: Document prepared by the CA that guides commissioning work through construction, verification, and warranty periods. The plan will include a listing of commissioning team members, systems to be commissioned, narrative description of the commissioning tasks and responsibilities, and a draft copy of the commissioning forms to be executed by the Contractor.

C. Construction Phase: Phase of the project during which the facility is constructed and equipment is installed and started. During the Construction Phase, the Contractor completes construction checklists, performs equipment start-up, performs TAB work, submits O&M manuals, and performs control system verification. The Construction Phase generally ends at Substantial Completion.

D. Verification Phase: Phase of the project during which functional testing and operator training is performed. The Verification Phase generally begins at Substantial Completion and ends at Final Completion.

E. Online Commissioning System: The CA will maintain an online commissioning system, which serves as a central location for accessing commissioning documents such as the Owner's Project Requirements, Commissioning Plan, status reports, design reviews, submittal reviews, schedules, and Issues Log. The online system provides current project information to authorized project team members through general internet access. The site URL is https://www.swecx.com. The Issues Log portion of the site allows for the Owner's Construction Manager, Architect, and General Contractor to provide comments, document actions, and indicate resolutions.

1.04 SUBMITTALS

A. Designated Commissioning Team Representatives: Submit list of names and contact information for individuals representing Contractor and Subcontractor as members of Commissioning Team.

B. Construction Schedule: Submit updated project construction schedule to CA monthly. Incorporate time and duration of Commissioning activities, as provided by CA, into the construction schedule

C. Construction Submittals and Shop Drawings: Provide as required to perform commissioning work.
   1. Contractor to provide CA a copy of submittal log. CA will review log and identify submittals that are associated with equipment and systems being commissioned and required to be submitted to the CA.
   2. Contractor to provide an electronic copy of each submittal or shop drawing to the Owner's Representative, including all resubmissions, required by the CA at the same time submittals are provided to the Design Team. CA will review submittals concurrently with the Design Team and provide review comments to the Design Team. The Design Team will consolidate review comments into a single submittal review response to be provided to the Contractor.
   3. Contractor to provide a copy of Design Team submittal review comments to the CA.

D. Engineering Data: Provide shop drawings, product data, performance data, engineering data, installation and start-up data, operation and maintenance information, schematics, wiring diagrams, programming manuals, and similar information as necessary for completion of the Work of the Section in accordance with Commissioning Schedule.

E. Construction Checklists: Complete and submit to CA for certification. Attach copies of all manufacturers' field or factory performance and start-up test documentation provided for associated equipment or systems.

F. Control Verification Reports: The Contractor shall provide complete Control Verification Reports to the CA.

   1. Complete reports developed by CA and submit to CA for certification.
   2. Contractor to provide the CA with sample point-to-point verification forms that the Contractor will use during initial start-up and verification of systems. The CA will review the forms and provide comments as necessary to the Contractor.

G. Operator Training Schedule: Contractor shall submit training schedule listing all required training sessions as specified and in accordance with Training Plans. Training schedule shall include date and time of training, location, and name and qualification of trainer, and facilities needed for training. Training Schedule to be submitted to Owner's Authorized Representative four weeks prior to substantial completion.

H. Testing, Adjusting and Balancing: Contractor to provide draft and final TAB reports to CA for review.

I. Operations and Maintenance Manuals: Furnish a copy of draft and final Operations and Maintenance Manuals for review by CA. CA will provide review comments to Commissioning Team upon completion of CA review.

1.05 QUALITY ASSURANCE

A. Provide qualified mechanics and technicians to provide required commissioning services. Technicians shall have knowledge of the Work and experience with installation and operation of the general systems and components involved to assist in commissioning activities. Individuals shall be adequately equipped to effectively assist the CA as necessary. Upon request submit names and qualifications of technicians to CA for approval.

B. Provide qualified instructors to perform operator training. Instructor shall be knowledgeable in the specific equipment and systems involved. Upon request submit names and qualifications of technicians to CA for approval.

1.06 DUTIES OF TESTING ADJUSTING AND BALANCING CONTRACTOR IN COMMISSIONING

A. Balancing Contractor shall attend a prebalancing coordination meeting with the Owner, Engineer, CA, and General Contractor. Meeting shall be attended by Project Supervisor. Prebalancing meeting shall be conducted four weeks prior to start of balancing.
Meeting agenda shall include:
1. Balancing schedule.
2. General balancing procedures.
3. Special balancing procedures.
4. Coordination with General Contractor.
5. Coordination with Control Contractor.
6. Review of BAS control parameters to be determined by Balancing Contractor.

B. Document and log inconsistencies or deficiencies in system operations and system compliance. Provide report to CA, Contractor, Architect, and Owner's Authorized Representative.

C. Provide weekly status reports after balancing has started to the CA, Contractor and Owner's Authorized Representative. Reports shall include a summary of work completed, abnormal or deficient conditions encountered, and updated schedule of work.

1.07 SEQUENCING

A. Schedule adequate time as determined by CA for execution of Commissioning Plan.

B. CA will conduct a Commissioning Process Meeting approximately 30 days after Contractor received Notice-to-Proceed and after all subcontractors are identified.

C. CA will prepare a Construction Phase Commissioning Plan approximately 30 days after Commissioning Process Meeting.

D. Provide construction submittals and shop drawings to CA as described above in SUBMITTALS.

E. Provide engineering data as required by CA to prepare Construction Checklists within four weeks after date of approved submittal.

F. CA will conduct an initial commissioning coordination meeting approximately 30 days before equipment begins to arrive at the project site to coordinate commissioning activities and execution of construction checklists. Additional commissioning coordination meetings will be

scheduled as necessary throughout the process to discuss commissioning schedule and coordination among trades.

G. Perform Construction Checks as equipment is received, installed, and placed in operation. Construction checks shall be performed as work is completed. For example, equipment inspection shall be performed upon receipt of equipment on site, installation inspection shall be performed when equipment is set in place and anchored, and so on.

H. Submit schedule for operator training to Owner's Authorized Representative and CA four weeks prior to Substantial Completion. Schedule shall include time and duration of each required training session.

I. Submit control verification reports three weeks after Substantial Completion.

J. Functional testing will be scheduled after construction checklists; testing, adjusting, and balancing report; and control verification reports have been submitted and accepted. Contractor shall provide written notice that systems are completely operational and ready for functional testing. Functional testing may proceed prior to acceptance if the CA and Owner's Authorized Representative determines that deficiencies will not significantly affect system performance and timing is critical. The CA will provide notification to Contractor, Architect, and Owner's Authorized Representative a minimum of one week prior to performing functional testing.

K. Submit draft operations and maintenance manuals to Owner's Authorized Representative 30 days prior to substantial completion.

L. Operator training shall be performed within a 30-day period following Substantial Completion.

M. Troubleshooting, corrections, and retesting shall be completed within 3 months of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide specialized test equipment including manufacturer's proprietary test equipment, as necessary for commissioning of mechanical, plumbing and electrical systems and components. Comply with requirements of individual technical Sections of Division 22, 23, 26. Common test equipment such as temperature, pressure, speed, and electrical power measuring devices shall be provided by CA.

PART 3 - EXECUTION

3.01 APPLICATION

A. Commissioning Meetings: Commissioning Team shall attend meetings as required by CA including Commissioning Process Meeting, submittal review meetings, and coordination meetings prior to construction checks; adjusting and balancing; and functional testing. Commissioning team shall attend troubleshooting meetings as required to resolve issues identified in submittal reviews and commissioning reports.

B. Construction Checklists:
1. Provide equipment installation, start-up, and operating information requested by the CA as required to develop Construction checklists.
2. Perform construction checks for all equipment being commissioned as described in Construction Checklists prior to equipment start-up. The Contractor shall designate responsibility for completing construction checks among subcontractors. The designated subcontractor shall initial and date each item on checkout sheets as completed and submit executed forms to CA for certification. All items listed in the Construction Checklists shall be complete prior to certification unless the incomplete item does not affect safe and reliable equipment operation. If such an item is identified, a description of the incomplete work must be attached to the Construction Checklists. Equipment requiring construction checkout shall not be started until the Construction Checklists are fully executed by the Contractor.
3. Contractor shall maintain “Cx Submittal Status Report”. CA will furnish Excel status report spreadsheet that will be used to monitor completion of construction checklists.
4. Contractor shall startup equipment as described in construction checklists. Where required, provide manufacturer's agent to perform start-up as specified in Divisions 22, 23, and 26.
5. Fully executed Construction Checklists shall be submitted to the CA for certification.
6. CA will document unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.
7. CA shall perform a recheck of selected equipment. If minor discrepancies are identified, Contractor shall recheck all similar systems and resubmit Construction Check forms for certification. If major discrepancies are identified, CA shall perform Construction Checks, and Contractor shall compensate Owner for additional commissioning costs by Contract modification.

C. Control Verification Reports:
1. Perform control system verification and prepare verification reports as specified in Divisions 23. Verification shall be performed by manufacturer’s authorized installation contractor. Verification report shall include a description of the incomplete work.
2. Submit completed Control Verification Reports to the CA for acceptance.
3. CA will document unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.

D. Functional Tests:
1. Assist CA in performing Functional Tests, which shall generally include operating equipment and systems as necessary for testing. The CA will record test measurements and documentation of results.

2. CA will document all unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.
3. CA shall retest selected systems once to verify that corrective work is complete. Retests will be performed after notification from the Contractor that work is complete. If corrective work is not complete and additional retesting is required, Contractor shall compensate Owner for costs of additional CA testing sessions by Contract modification.

E. Operations & Maintenance Manuals: Contractor shall provide complete operation and maintenance information for all equipment and systems being commissioned. Information shall be suitably bound, organized, and comprehensive. CA will review and provide written review comments to the Owner's Authorized Representative.

F. Operator Training: Instruct Owner's operating personnel in operation and maintenance of mechanical and electrical equipment and all systems being commissioned.
1. Instruct Owner in proper operation and maintenance of equipment and systems. Instruction shall generally include topics listed in manufacturer's operations and maintenance manual. Operator instructions shall cover all aspects of manual, automatic, and safety controls. Contractor shall also instruct the Owner in the general configuration of systems and location of equipment and components. Equipment shall be fully operational prior to instruction.
2. Contractor shall furnish training by equipment manufacturers where specifically required. Manufacturer's field start-up and adjustment will not fulfill manufacturer's training requirement.
3. Contractor shall coordinate operator training with the Owner's Authorized Representative and CA as follows:
    a. Training Plan: The CA shall develop an Operator Training Plan, which provides details regarding the type and amount of training required. The plan will include a Training Record and an Evaluation section to be executed at the completion of each training session.
    b. Training Schedule: Contractor shall develop a training schedule for approval by the Owner's Authorized Representative.
    c. Training Record and Evaluation Section: The Training Record and Evaluation section included on the Training Plan provide documentation of the attendees, duration, and quality of each training session. The Contractor shall complete Training Record after each training session. The Owner's Authorized Representative will complete the evaluation section of the Training Plan and the completed plan shall be returned to the CA. Training will not be accepted until the Training Plan is returned to the CA with the Record and Evaluation sections fully executed.

G. Issues Resolution: Unresolved issues will be listed in the project online Issues Log. Refer to Online Commissioning System in Article 1.03, Definitions above. Each issue will be identified with an identification number. The Issues Log will include a description of the unresolved condition, identify the responsible individual(s), and describe suggested corrective action. The Contractor will periodically access the On-line Commissioning System to monitor the status of commissioning issues, and shall diligently complete all tasks that are identified as the responsibility of the Contractor. The Contractor shall modify on-line issue status when each item is completed and provide a description of corrective action performed. Contractor and related subcontractors shall attend commissioning meetings to review the Issues Log and coordinate resolution of issues as required by the CA.

3.02 QUALITY CONTROL

A. Provide mechanics that are experienced with the Work and installed components of each system to assist in completion of the commissioning activities.
   1. Work necessary to provide systems complying with performance requirements of the contracts is the Contractor's responsibility.

B. Manufacturer's Field Services: Provide manufacturer's representatives with expertise in components and systems. Where required, manufacturer’s representative shall perform start-up, testing, and maintenance training of Owner's facilities staff including classroom and onsite instruction.

3.03 ACCESS TO WORK

A. Contractor shall provide facilities and access for CA to perform work including but not limited to:
   1. Keys, security passes, passwords, codes, etc.
   2. Ladders
   3. Lifts where work is more than 12 feet above floor level
   4. Removal of ceiling tiles, partitions, panels, or other fixed construction necessary for completion of work
   5. Proprietary programming and metering equipment

END OF SECTION

SECTION 02 32 00 – GEOTECHNICAL INVESTIGATION

PART 1 GENERAL

1.01 DESCRIPTION

A. The geotechnical engineering report is provided for information to bidders by the Owner.

1. The information is titled “Geotechnical Engineering Report, 3410 K Street, Parcel No: 09S40E08CC00200, Baker City, Oregon 97814" prepared by Liberty Geotechnical Engineering, Inc., dated July 26, 2024.
2. The “Geotechnical Investigation” is included, following this page, for reference. Neither the Owner nor the Project Manager is responsible for any conclusions that the bidder may draw from the report.

B. Reports were prepared during the schematic design phase of the project. Review contract drawings for exact building and site plan configurations.

C. Owner is not responsible for variations at locations other than those given or for changes after test pits were excavated.

1.02 RELATED SECTIONS:

A. Section 01 4000: Quality Control.

B. Section 03 3000: Concrete Foundations.

C. Divisions 22 and 26: Trenching for Mechanical and Electrical Work.

D. Divisions 31, 32, and 33: Site Work.

1.03 BIDDER’S RESPONSIBILITY

A. Bidder agrees to the following provisions:

1. Bidder has examined the complete report.
2. Bidder assumes responsibility for any conclusions bidder may draw from the geotechnical report.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not used

END OF SECTION

Geotechnical Engineering Report
3410 K Street
Parcel No: 09S40E08CC00200
Baker City, Oregon 97814

Prepared For:
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Baker County Oregon
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Prepared By:

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OREGON
MARCH 9, 2010
BRIAN W. BINSFIELD

Report Date: July 26, 2024
Job Number: 24089

Table of Contents

1.0 EXECUTIVE SUMMARY **2**
2.0 PROPOSED CONSTRUCTION **2**
3.0 GEOTECHNICAL EXPLORATION **3**
3.1 Geology, Topography, and Current Site Use 3
3.2 Summary of Soil Encountered During Exploration 4
3.3 Estimated Groundwater Elevations 4
3.4 Summary of Infiltration Testing 4
4.0 LABORATORY TESTING RESULTS **4**
4.1 Summary of Laboratory Testing Results 4
5.0 GEOTECHNICAL RECOMMENDATIONS **5**
5.1 Earthwork 5
5.1.1 Subgrade Preparation 5
5.1.2 Earthwork Soil Products, Compaction, and Testing Frequency 5
5.1.3 Excavation Construction Considerations 8
5.1.4 Weather-Related Earthwork Considerations 8
5.2 Shallow Foundation Design 9
5.3 Concrete Slab Design and Construction Considerations 9
5.4 Seismicity and Liquefaction 10
5.5 Lateral Earth Pressure Design 11
5.6 Drainage and Stormwater Infiltration Recommendations 11
5.7 Pavement Section Design Recommendations 12
6.0 DESIGN REVIEW AND CONSTRUCTION OBSERVATIONS **12**
6.1 Geotechnical Consultant versus Geotechnical Inspector 12
6.2 Revisions and Transfer of Geotechnical Recommendations 13
7.0 REFERENCES **13**

Appendices

Appendix A: Geotechnical Engineering Report Checklist
Appendix B: Exploration Site Plan
Appendix C: Subsurface Exploration Logs
Appendix D: Field Infiltration Testing Results
Appendix E: Laboratory Testing Results
Appendix F: Photo Log

1.0 EXECUTIVE SUMMARY

The following geotechnical engineering report has been prepared for a building expansion of the Baker County Sheriff's Office located at 3410 K Street in Baker City, Oregon. The following items have been identified at the project site and proposed construction that should be carefully considered during design and construction:

- Undocumented fill was observed to a depth of approximately 4½ to 7 feet below the ground surface. Based on the SPT blow counts, the relative density of the fill was very soft to soft.
- The undocumented fill should be removed to a depth of two feet below concrete driveways, sidewalks, or patios, and should be fully removed below shallow foundations, or settlement-prone, heavily-loaded structures.
- Foundations should bear on the compacted native soil or *Structural Fill*.. A suitable bearing layer was encountered at 2.5 to 5 feet and below the existing fill.
- The silty soils at the site are considered to be highly frost-susceptible. If these soils become saturated and freeze, heave may occur. One way to reduce the potential heave is to remove any frost-susceptible soil down to below the frost line and replace it with non-frost-susceptible, compacted sand or gravel with less than 5 percent passing the No. 200 sieve. Sand or sandy gravel, having less than 5 percent particles by weight passing a 200 sieve, is considered to be non-frost-susceptible.
- A moisture barrier should be installed if moisture-sensitive flooring is proposed. Additional recommendations can be provided upon request.

An important checklist is provided for convenience in Appendix A: *Geotechnical Engineering Report Checklist* that summarizes the recommended involvement during design and checkpoints during construction. If Liberty Geotech (or an approved third-party testing firm) is not afforded the opportunity to observe and test as recommended in this report, Liberty Geotech is not the engineer of record. Furthermore, Liberty Geotech does not have any liability for the recommendations provided if no observations or testing is performed. Liberty Geotech is available to clarify any unclear recommendations provided in the report further in person or via a conference call.

2.0 PROPOSED CONSTRUCTION

The proposed construction consists of a building expansion of the Baker County Sheriff's Office along with associated stormwater management facilities and pavement areas. The expansion will be 4,000 to 5,000 square feet. The type of construction is proposed to be a one-story, wood-framed commercial building. The building foundation is assumed to be shallow, concrete footings with concrete slab-on-grade flooring support.

Stormwater disposal will consist of swales, typical single or double-depth drywells positioned within the swale areas, or a gravel infiltration gallery.

Furthermore, the recommendations included in this report are based on an aerial imagery of the site plan provided by the client, not dated.

3.0 GEOTECHNICAL EXPLORATION

Subsurface exploration was performed by drilling three exploratory borings to depths ranging from 6.5 feet to 16.5 feet below the ground surface. The drilling was performed with a SANY drill rig. Standard penetration test (SPT) soil sampling was performed at approximately 2.5-foot intervals. The sampler diameter was a standard split spoon sampler. In addition, a single-ring infiltration test was performed on the north side of the property. Subsurface exploration was performed at the project site on July 9, 2024. The exploratory boring logs are attached in Appendix C: *Subsurface Exploration Logs*. The contractor or client is recommended to notify Liberty Geotech if the soil conditions are different from those described in the following sections.

Throughout this report, test pit infiltration test and boreholes are abbreviated TP and BH and are hyphenated with a numbering system that corresponds to Appendix B: *Exploration Site Plan* and Appendix C: *Subsurface Exploration Logs*. The test pit and boreholes were located in the field using the accuracy of a cell phone location system. The locations were not surveyed and the accuracy is expected to be within 10 feet of the depicted location. Also, the elevation of each test pit and borehole was estimated using the Google Earth™ mapping service with the GWS84 EGM96 geoid.

3.1 Geology, Topography, and Current Site Use

The *Geologic Map and Sections of the Baker Quadrangle, Oregon* (Gannet and Mckee, 1937) was reviewed to determine the geologic deposit at the site. The geologic map indicated that the geologic unit was a deposit in the present stream valleys, and alluvial fans. In addition, the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS, 2024) was reviewed. The soil survey indicates that the soil unit is the Powval silt loam consisting of silt loam from the ground surface to a depth of 100 inches. The soil survey describes the soil as a mixed alluvium.

The site has existing structures with asphaltic-concrete parking area. The topography is relatively level with approximately one to two feet of elevation change across the site based on the elevations obtained from the Google Earth™. Analysis of historical aerial imagery reveals the existing structures were constructed before 1994.

3.2 Summary of Soil Encountered During Exploration

The soil encountered during the exploration is generally consistent with the geologic research. However, undocumented fill was observed to depths of 4½ and 7 feet below the ground surface. Below the fill, all boreholes encountered alluvium consisting of sandy silt, silty sand, silt with sand, and well-graded sand with silt and gravel.

3.3 Estimated Groundwater Elevations

Groundwater was not observed during the exploration. According to the well logs in the vicinity of the site (Oregon Water Resources Department Well Report Mapping Tool), the static water levels can range from approximately 17 to 27 feet beneath the ground surface. Seasonal and annual fluctuations in groundwater levels should be anticipated.

3.4 Summary of Infiltration Testing

A single ring infiltration test was performed at TP-1, and the results are provided in Appendix D: *Field Infiltration Testing Results*. The test pit was excavated to a depth of three feet and a single-ring infiltrometer was installed. The portion of the ring was embedded to the soil approximately 14 inches and the exposed height of the ring was 10 inches. The diameter of the pipe used was 12 inches. The rates for infiltration were calculated based on the total area of soil inside a ring. The infiltration test lasted for five hours and 47 minutes.

The civil engineer is recommended to use a design infiltration rate of 2.68x10–5 cubic feet per second per square foot (cfs/sf) for an infiltration gallery that is placed in the vicinity of the TP-1. A factor of safety of 1.3 has been used to develop the recommendation.

4.0 LABORATORY TESTING RESULTS

Soil samples were obtained in the exploration locations at varying depths to characterize the alluvium. The results of laboratory testing results are presented in Appendix E: *Laboratory Testing Results*. The laboratory testing was performed referencing the following American Society for Testing and Material Standard Methods (ASTM):

- ASTM D1140 *Amount of Material in Soils Finer than the No. 200 Sieve*,
- ASTM D2216 *Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass,* and
- ASTM D6913 *Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis*.

4.1 Summary of Laboratory Testing Results

The following table summarizes the laboratory tests that were performed on the soil samples obtained from the site. Additional details are provided in Appendix C and E.

Table 4.1.A - Summary of Laboratory Testing

Soil Unit	Lab Tests Performed	Summary of Results
Native Alluvium	● Percent Passing No. 200 Sieve ● Gradation Sieve ● Natural Moisture Content	Soil is classified as well-graded sand with silt and gravel, silty sand, and sandy silt. ● C_u: 33.7 ● C_C: 1.4 ● % Passing No. 200: 7% - 55% ● Moisture Content: 5.1% - 31.7%

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 Earthwork

The following recommendations should be considered by the general contractors and earthwork subcontractors prior to providing a cost estimate for the earthwork on the project.

5.1.1 Subgrade Preparation

Clear and grub all vegetation, strip all remaining topsoil, and remove undocumented fill to prepare the subgrades under all foundations, floor areas (either slab-on-grade or wood-framed flooring areas), asphalt, or concrete paved areas. Undocumented fill removal is estimated to be 4.5 to 7.0 feet across the building footprint. All footings should bear on compacted native soil or *Structural Fill* as verified by Liberty Geotech.

All stormwater facilities should be a minimum of ten feet from foundations and hardscapes to minimize the effects on improvements.

Liberty Geotech should be contacted once the subgrade areas have been exposed to review the subgrade conditions.

5.1.2 Earthwork Soil Products, Compaction, and Testing Frequency

Different soil products should be used for different applications. The following table presents recommendations for anticipated earthwork construction:i

Table 5.1.2.A - Soil product selection.

Soil Product	Project Use	Soil Description
Structural Fill	● Fill areas under the foundation.	Soil classified as: ● Well-Graded or Poorly-Graded

	• Fill to achieve subgrade under the slab or driveway. • Backfill of shallow foundations.	Gravel with Silt (GP-GM or GW-GM) • Silty Gravel (GM) • Well-Graded or Poorly-Graded Sand with Silt (SP-SM or SW-SM) • Silty Sand (SM) Soil should be free of organics, deleterious material, and all material larger than 6-inches in diameter.
Concrete Slab Cushion	• Fill immediately below slab-on-grades, sidewalks and exterior hardscapes.	Soil should meet the percent passing the following sieve size: • 1”: 80-100% • No. 4: 25-65% • No. 200: 6% maximum Soil should be free of organics, clay fines, deleterious material, and all material larger than 2-inches in diameter.
Crushed Surfacing	• Fill immediately below slab-on-grades, asphaltic pavement, concrete pavement, sidewalks and exterior hardscapes.	Crushed rock should meet the percent passing the following sieve size: • 1-¼”: 99-100% • 1”: 80-100% • ⅝”: 50-80% • No. 4: 25-45% • No. 40: 3-18% • No. 200: 7.5% maximum • Sand equivalent: 40 minimum Also, the material should be free of wood, roots, bark, and deleterious material. For roadway base the following requirements should also be met: • Fracture face: 75%, minimum • Los Angeles Wear, 500 rev: 35%, maximum. • Degradation factor: 15 minimum.
Landscaping Fill	• Non-structural fill areas. • Vegetated areas.	Soil meeting the following requirements: • Silt or Clay: 35% to 70% • Sand: 20% to 60% • Organic material: 2% to 20% • Deleterious materials (gravel, rock, slag, cinder, roots, sod): 5% max • pH between 5 and 7

The following table provides compaction recommendations specific to ASTM D1557 *Laboratory Compaction Characteristics of Soil Using Modified Effort.* All fill products should be compacted in lifts of soil not exceeding 12 inches measured prior to compaction.

Table 5.1.2.B - Compaction recommendation.

Project Use	Recommended Compaction
● Fill areas under the foundation. ● Fill to achieve subgrade under the slab or driveway. ● Fill immediately below slab-on-grades. ● Fill immediately below the asphaltic-concrete pavement, concrete pavement, sidewalks, and exterior hardscapes.	95 percent of the maximum dry density of Modified Proctor.
● Exterior wall backfill. ● Utility trench backfills.	92 percent of the maximum dry density of Modified Proctor.
● Non-structural fill areas. ● Vegetated areas.	80 to 85 percent of the maximum dry density of Modified Proctor.

If more than 30 percent of native or imported *Structural Fill* material is retained on the ¾" sieve, ASTM D1557 *Laboratory Compaction Characteristics of Soil Using Modified Effort* is not recommended to be used. In this case, a soil-specific method specification can be developed. A nuclear density gauge can be used during earthwork operations to establish a moisture and compaction method that provides an acceptable maximum dry density. Method specification earthwork operations are recommended to have full-time soil testing to ensure adequate compaction.

The soil products are recommended to have passing compaction testing results at the following frequency to ensure the soil is uniformly meeting compaction requirements. Failing test results should be retested after additional compactive effort and, if necessary, water is added. At least 90% of the compaction testing results must achieve the required maximum dry density or as approved by the engineer of record.

Table 5.1.2.C - Testing Frequency.

Project Use	Testing Frequency
● Below interior building concrete slabs for fill less than a vertical foot.	2,500 square feet and a minimum of 2 tests.
● Along the building footings for every vertical foot of fill.	50 lineal feet and a minimum of 2 tests.

• Structural fill placements larger than one foot in height	100 cubic yards
• Fill under asphalt parking areas and exterior concrete flatwork	5,000 square feet and a minimum of 2 tests.
• Utility trenches for every two vertical feet of trench backfill.	300 lineal feet and a minimum of 2 tests.

The jurisdictional requirements should be conformed to if there is a conflict with the requirements of Table 5.1.2.C. Excavations deeper than four feet must have adequate trenching protection or sloped back in accordance with state and federal requirements in order to be compaction tested.

5.1.3 Excavation Construction Considerations

Undocumented fill and alluvium are removable with a toothed bucket on an excavator.

No excavation support or sloped excavation has been reviewed in preparation of this report. The contractor should perform excavations in accordance with state and federal regulations. If requested, Liberty Geotech is available to provide further analysis of excavation support or shoring design. Liberty Geotech is not responsible for the safety of trenches, excavations or shoring support.

5.1.4 Weather-Related Earthwork Considerations

Wet weather, freezing conditions, or snow can impede or prevent earthwork operations. The following recommendations should be considered by the contractors and owners during construction:

1. It is not recommended that soil products be placed during freezing conditions. No concrete or soil products should be placed on frozen soil.
2. The on-site soils and other imported materials may become saturated during earthwork operations and will reduce operation production.
3. Stockpiles of soil products should be protected during wet weather. Soil products that have been compacted should be protected and not traveled on during wet weather to prevent disturbing the subgrade.

This report does not provide recommendations for erosion, runoff, trackout from trucks removing site stripping, or environmental considerations associated with earthwork operations.

5.2 Shallow Foundation Design

The following design parameters are provided based on the project understanding described in Section 2.0. Liberty Geotech should be notified to revise or confirm the following recommendations if the building location, locations of the site improvements, or structural loads change.

- Allowable bearing capacity for foundations: 2,000 psf.
- Footing embedment for exterior foundations*:* 2 feet.
- Estimated total settlement for foundations on compacted native soil or *Structural Fill:* Less than 1 inch.
- A sliding coefficient of friction of 0.35 may be used between the shallow foundations and compacted native soil or *Structural Fill*.

Differential settlement can occur when two different foundations exert different bearing pressures on the soil. The magnitude of the differential settlement depends on the foundation pressure difference. Or, differential settlement can occur due to differences in the soil resistance to the foundation pressure. Differential settlement is anticipated to be less than ½ inch.

5.3 Concrete Slab Design and Construction Considerations

The following recommendations should be considered to be the minimum design requirements. The structural engineer's design supersedes these recommendations. A structural engineer should design concrete slabs supporting more than 200 pounds per square foot.

- The concrete slab should be a minimum of four inches thick.
- The slab reinforcement is recommended to not be less than No. 3 rebar, 18 inches on center in both directions, and constructed in the middle of the slab. There is a high probability that the concrete slab will crack if rebar is not constructed in the slab.
- The modulus of subgrade support is recommended to be 230 pounds per square inch per inch (pci).
- The slab should be supported with four inches of compacted *Concrete Slab Cushion* soil in accordance with Section 5.1.

Vapor transmission through the concrete slabs may damage moisture-sensitive floor coverings. Also, substantial moisture can penetrate slabs if they are cast on soils that are saturated. The moisture may be measured and should not be above 3 pounds per 1,000 square feet per 24-hour period as measured in ASTM F2170 *Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride*. In addition, the in-situ relative humidity measurements may be determined at 40 percent of the slab depth. The client should consult with the flooring manufacturer for an acceptable slab relative humidity measurement prior to installing floor coverings. The relative humidity measurements should be

made in accordance with ASTM F2170 *Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes*.

The design and ownership team should carefully consider the design publication *Guide to Concrete Floor and Slab Construction* (ACI, 2015) before omitting a vapor retarder under the slab. If a moisture retarder is used, it should meet the requirements of ASTM E1643: *Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*.

Concrete slabs can crack because of numerous reasons. The following considerations should be mitigated during construction to reduce the risk of the concrete slabs cracking.

- The concrete mix design can be altered based on the ambient temperature, aggregate moisture content, anticipated time in the mix truck, and finishing methods. A poorly designed mix that does not incorporate these factors can cause concrete slabs to crack.
- The contractor's means and methods can cause concrete slabs to crack including improper placement of rebar support, improper crack control joints, improper curing methods or poor finishing techniques, and placing concrete during cold or hot weather.

5.4 Seismicity and Liquefaction

The proposed site is designated a **Site Class E**. The following table presents seismicity coefficients referencing the 2018 International Building Code (IBC) code. The acceleration parameters listed are based on interpolated values calculated from the ASCE 7-16 code (OSHPD). The interpolations were visually confirmed with the maps in Table 1613.2.1(1) through 1613.2.1(8) in the 2018 IBC.

Table 5.4.A Seismic Design Parameters

0.2 Second MCE Spectral Response Acceleration	S_s	0.335
1.0 Second MCE Spectral Response Acceleration	S_1	0.119
0.2 Second MCE Spectral Response Acceleration	S_{DS}	0.483
1.0 Second MCE Spectral Response Acceleration	S_{D1}	0.332
Design Peak Ground Acceleration	PGA_M	0.322

Latitude: 44.7920399

Longitude: -117.84871

There is a moderate potential for liquefaction based on the review of the Data Basin Oregon Liquefaction Susceptibility Map (2024).

5.5 Lateral Earth Pressure Design

The following table provides equivalent fluid pressures recommended to be used by the structural engineer. Walls with a back slope or slope in front of the wall (toe slope) should have the global stability analyzed.

Table 5.5.A Lateral Earth Pressure Design Parameters

Equivalent Fluid Pressure Designation	Unit Weight (PCF)
Active Equivalent Fluid Pressure	40
At-rest Equivalent Fluid Pressure	55
Passive Equivalent Fluid Pressure	350

Retaining walls backfilled with clean (less than 5% passing the No. 200 sieve) *Crushed Surfacing* may use a reduced lateral active and at-rest earth pressure. The fill should be compacted to 92% of the dry density of the modified Proctor, ASTM D1557. A triangular zone based on a 45-degree projection from the toe of the foundation should be backfilled with *Crushed Surfacing.* If these conditions are met, the active EFP may be reduced to 30 pcf, and the at-rest EFP may be reduced to 40 pcf.

Concrete foundation walls that are fully restrained should be designed for at-rest equivalent fluid pressure. Flexible walls or concrete walls that are allowed to crack may be designed for the active equivalent fluid pressure. Soil that is preventing a retaining wall or foundation wall from sliding may be analyzed with the passive equivalent fluid pressure.

5.6 Drainage and Stormwater Infiltration Recommendations

The soil conditions are suitable for subsurface infiltration. The following recommendations should be used by the civil engineer to design bio-infiltration swales, drywell structures, or infiltration galleries:

- The depth to a restrictive layer is at least 27-feet below the ground surface based on a review of well logs available in the vicinity of the site (Oregon Water Resources Department Well Report Mapping Tool, 2024).
- Swales and drywells should be located 10 feet from the edge of buildings and concrete hardscapes to minimize the effects of infiltration.

- Hardscaping and landscaping should be sloped at least five percent away from buildings or settlement-prone site improvements.

Subsurface infiltration using bio-infiltration swales or infiltration galleries may be designed with a hydraulic conductivity of 23 inches per hour, which should be used for infiltration design.

Single- and double-depth drywells may utilize a design outflow rate of 0.14 and 0.23 cubic feet per second, respectively. The drywells should be installed within the relatively clean sand encountered at a depth of 12 feet below ground surface. Single- and double-depth drywells must conform to the jurisdiction specification in which they were constructed.

5.7 Pavement Section Design Recommendations

The following pavement design recommendations are provided for 3.0 inches of asphaltic-concrete pavement over 6.0 inches of *Crushed Surfacing*. The Structural Number for this pavement section is 1.84 and the number of passes with an equivalent single-axle load (ESAL) is 35,000. The following design parameters were used in the analysis:

- Subgrade support modulus, M_r: 8,000 psi.
- Reliability percent: 80%.
- Standard deviation: 0.45.
- Asphaltic-concrete layer coefficient, a1: 0.42.
- Aggregate base layer coefficient, a2: 0.12.
- Drainage coefficient of aggregate base, m: 0.80.

Paving operations can be observed and tested by Liberty Geotech at the request of the owner. Asphalt should be compacted to 92 percent of the Rice density. Liberty Geotech can provide additional traffic analysis or life-cycle cost analysis upon request.

6.0 DESIGN REVIEW AND CONSTRUCTION OBSERVATIONS

6.1 Geotechnical Consultant versus Geotechnical Inspector

In order to retain Liberty Geotech as the geotechnical engineer of record, the client must contact Liberty Geotech or require their contractor to contact Liberty Geotech to perform the observations and notifications that are recommended within this report. Liberty Geotech is not the engineer of record and has no liability for the construction or design based on this report if observations and material testing are not performed and meet the recommendations contained within this report. In addition, Liberty Geotech's liability is limited to the authorized proposal dated May 20, 2024.

6.2 Revisions and Transfer of Geotechnical Recommendations

Liberty Geotech should be notified to update recommendations if the proposed development changes or subsurface soil or groundwater conditions vary from those described in this report. This report cannot be relied upon by property owners adjacent to this property without confirmation of their specific site soil conditions. Also, the report recommendations cannot be transferred to other business entities or subsequent property owners without written authorization. No warranty or certification of construction is provided with this report. Liberty Geotech should review the final construction drawings to confirm the incorporation of the recommendations of this report.

7.0 REFERENCES

ACI Committee 302. “Guide for Concrete Floor and Slab Construction.” ACI 302.1R-15. American Concrete Institute, P.O. Box 19150 Redford Station, Detroit, Michigan 48219.

Applied Technology Council (ATC). “Hazards by Location.” Accessed July 24, 2024. https://hazards.atcouncil.org/

Gilluly, James, 1937. Geology and Mineral Resources of the Baker Quadrangle, Oregon. Department of the Interior United States Geologic Survey.

Oregon Department of Geology and Mineral Industries. “Data Basin, Oregon Liquefaction Susceptibility Map”. Accessed July 24, 2024. https://databasin.org/maps/

Oregon Water Resources Department. “Oregon Water Resources Department Well Report Mapping Tool”. Accessed July 23, 2024. https://apps.wrd.state.or.us/

United States Department of Agriculture, Natural Resources Conservation Service. “Web Soil Survey.” Accessed July 23, 2024. http://websoilsurvey.nrcs.usda.gov/

APPENDIX A

Geotechnical Engineering
Report Checklist

Geotechnical Engineering Report Checklist

LIBERTY GEOTECH

3012 N Sullivan Rd, Ste D, Spokane Valley, WA 99216

Job No: 24089
Project Name: 3410 K St
Project Address: 3410 K Street
Project City and State: Baker City, Oregon
Geotech Report Date: July 25, 2024

This checklist is a supplement to the report. The recommendations in the referenced *Geotechnical Engineering Report* must be implemented in their entirety to retain Liberty Geotech as the geotechnical engineer of record. The following recommendations do not supplant the requirements of the Building Official (BO). The BO can waive any or all recommendations within this checklist.

Design Review & Pre-construction	***Report No:***	***Signed Off***

Effects to adjacent structures, slopes, and property have been engineered.

Subgrade	***Report No:***	***Signed Off***

All undocumented fill has been removed below settlement prone structures. _____

Test pits have been remediated. _____

Drainage conditions are as anticipated in the geotech report. _____

Soil type and density are as anticipated in the geotech report. _____

The subgrade has been prepared. _____

Density testing has been performed.

Geotechnical Review of Foundations	***Report No:***	***Signed Off***

Acceptable embedment depth. _____

Structural Fill is an acceptable material. _____

The foundation has been stepped in accordance with the plans. _____

Density of *Structural Fill* is acceptable.

Concrete Hardscapes, Interior SOG, & Settlement-Prone Structures	***Report No:***	***Signed Off***

Material below slab is acceptable.

Density of material below slab is acceptable.

Site Grades, Embankments and Slopes	***Report No:***	***Signed Off***

Site grading and native slopes appear to conform to grading plan. _____

Embankment Fill is acceptable material. _____

Landscaping fill is acceptable material. _____

Density of *Embankment Fill* is acceptable.

Engineer of Record's Final Sign Off:

APPENDIX B

Exploration Site Plan



VICINITY MAP
(GOOGLE MAPPING SERVICE™)

APPROXIMATE SCALE - FEET

0 25 50

LEGEND

BH-1 BORE HOLE LOCATION

LEGEND

TP-1 TEST PIT INFILTRATION TESTING LOCATION

IMAGE SOURCE: GOOGLE EARTH

EXPLORATION SITE PLAN

3410 K STREET

PARCEL NO. 09S40E08CC00200

BAKER CITY, OREGON 97814

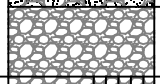
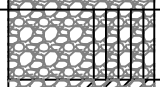
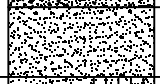
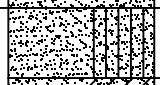
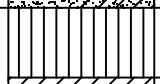
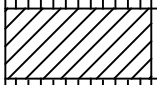
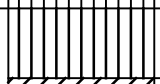
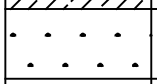
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JOB NO. 24089	JULY 25, 2024	PLATE 1

APPENDIX C

Subsurface Exploration Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS GROUP SYMBOL	SOIL DECRIPTION
COURSE GRAINED SOIL	GRAVEL	CLEAN GRAVEL		GW	WELL-GRADED GRAVEL
				GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES		GM	SILTY GRAVEL SILTY GRAVEL WITH SAND
				GC	CLAYEY GRAVEL CLAYEY GRAVEL WITH SAND
	SAND	CLEAN SAND		SW	WELL-GRADED SAND
				SP	POORLY-GRADED SAND
		SAND WITH FINES		SM	SILTY SAND
				SC	CLAYEY SAND
	SILT AND CLAY LIQUID LIMIT LESS THAN 50%			ML	INELASTIC SILT
				CL	LEAN CLAY
				OL	ORGANIC SILT
FINE GRAINED SOIL	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%			MH	ELASTIC SILT
				CH	FAT CLAY
				OH	ORGANIC CLAY
				PT	PEAT

ABBREVATIONS
BGS - BELOW EXISTING GROUND SURFACE
N.E. - NOT ENCOUNTERED

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	BLOW COUNTS (NVALUE)	% PASSING NO. 200 SIEVE	PL, LL, PI	MOISTURE CONTENT (%)	POCKET PENETRO-METER(TSF)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silt with Sand (ML) Very Soft, Dark Brown, Moist	3415	5		SS	WOH-WOH-1 (1)					Weight of Hammer
				SS	1-1-1 (2)					
ALLUVIUM - Silt with Sand (ML) Medium Stiff, Brown, Moist	3410			SS	2-2-3 (5)					
ALLUVIUM - Sandy Silt (ML) Medium Stiff, Gray Brown, Moist		10		SS	2-2-2 (4)					
ALLUVIUM - Well-Graded Sand with Silt and Gravel (SW-SM) Very Dense to Dense, Brown, Moist	3405	15		SS	15-26-30 (56)	7		5.1		
				SS	15-20-22 (42)					

Borehole completed at 16.5-feet bgs.

Client: Baker County Oregon	Borehole Number: 1		
Project: 3410 K Street	Project Number: 24089		
Equipment: SANY Drill Rig	Date Excavated: 7/9/2024		
Depth to Groundwater: NE	Logged By: TT		Sheet: 1 of 3

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	BLOW COUNTS (NVALUE)	% PASSING NO. 200 SIEVE	PL, LL, PI	MOISTURE CONTENT (%)	POCKET PENETRO-METER(TSF)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silt (ML) Soft, Dark Brown, Moist	3415			SS	1-1-3 (4)					
ALLUVIUM - Silty Sand (SM) Loose, Dark Brown, Moist		5		SS	3-3-4 (7)	45		31.7		

Borehole completed at 6.5-feet bgs.

Client: Baker County Oregon	Borehole Number: 2		
Project: 3410 K Street	Project Number: 24089		
Equipment: SANY Drill Rig	Date Excavated: 7/9/2024		
Depth to Groundwater: NE	Logged By: TT		Sheet: 2 of 3

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	BLOW COUNTS (NVALUE)	% PASSING NO. 200 SIEVE	PL, LL, PI	MOISTURE CONTENT (%)	POCKET PENETRO-METER(TSF)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silt (ML) Very Soft, Dark Brown, Moist	3415			SS	1-1-1 (2)					
ALLUVIUM - Sandy Silt (ML) Very Soft to Stiff, Gray Brown, Moist		5		SS	2-1-1 (2)	55		23.7		
	3410			SS	2-5-5 (10)					

Borehole completed at 8.0-feet bgs.

Client: Baker County Oregon	Borehole Number: 3		
Project: 3410 K Street	Project Number: 24089		
Equipment: SANY Drill Rig	Date Excavated: 7/9/2024		
Depth to Groundwater: NE	Logged By: TT		Sheet: 3 of 3

APPENDIX D

Field Infiltration Testing Results

Single Ring Infiltration Method TP-1

Project Name:	3410 K Street		**Client:**	Baker County Oregon	
Test Date:	7/9/2024		**Radius (ft)**	0.5	
Project Number:	24089		**Height (ft)**	1.166666667	
Actual Infiltration Rate:	3.48E-05	cfs/sf	**Total Area of Soil in Ring**	5.23	sq.ft
Factor of Safety:	1.3		**Total Time**	20,820	
Recommended Infiltration Rate:	2.68E-05	cfs/sf			

Time	Elapsed Time (minutes)	Hydraulic Head (inches)	Gallons	Notes
9:52	0	0.00	4.90	
11:17	85	7.75		
11:55	38	6.88		
12:23	28	6.00		
13:51	88	4.75		
13:54	3	6.00	2.94	Added 0.39 cu. ft of water
14:09	15	6.00	2.94	
14:24	15	6.00	2.94	
14:39	15	6.00	2.94	
14:54	15	6.00	2.94	
15:09	15	6.00	2.94	
15:24	15	6.00	2.94	
15:39	15	6.00	2.94	

APPENDIX E

Laboratory Testing Results

ASTM D6913 Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

Project: 3410 K St **Test No.:** 1 **Testing Date:** 7/12/2024

Job No: 24089 **Sample Location:** BH-1 at 12.5' to 14.0' bgs **Lab Technician:** Megan Calvert

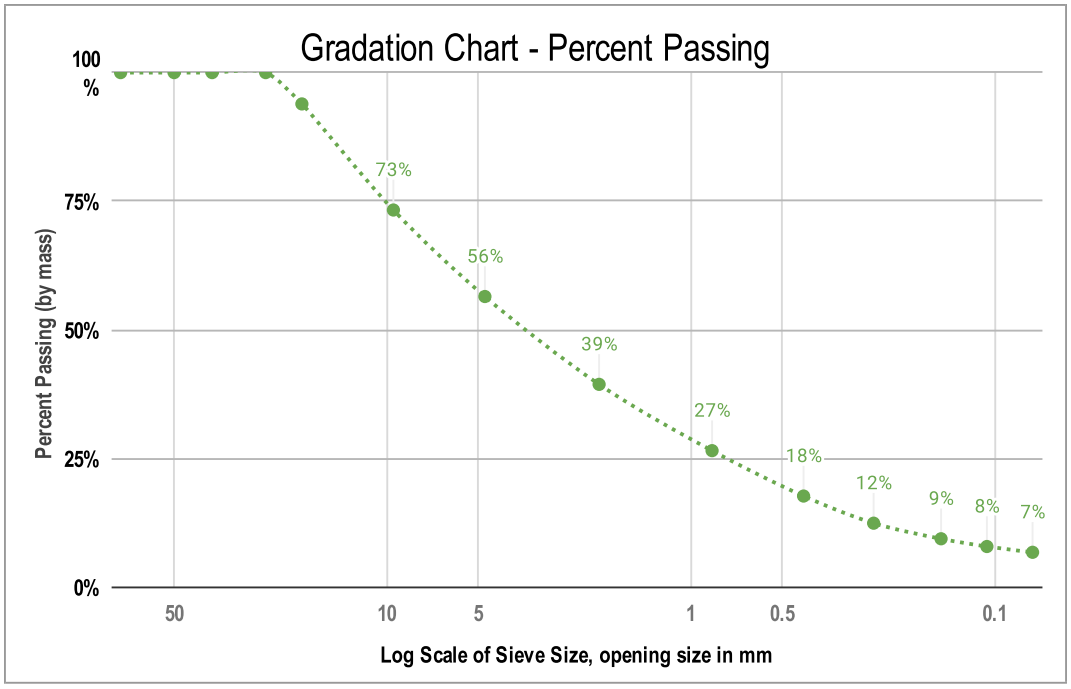
Method Used: Method A
Total Sample Mass: 578 grams
Drying Method: Oven Dry

Max Particle Size: 3/8"
Minimum Sample Size: 165 grams

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Summary:

3"	100%
2"	100%
1.5"	100%
1"	100%
3/4"	94%
3/8"	73%
#4	56%
#10	39%
#20	27%
#40	18%
#60	12%
#100	9%
#140	8%
#200	7%
Pan	0%



Notes:

Excluded Material: None.

Additional Results

Soil Classification: Well-graded Sand with Silt and Gravel
Percent Moisture: 5.1%
%Gravel: 44% **%Sand:** 50% **%Fines:** 7%
Coefficient of Uniformity, Cu: 33.7
Coefficient of Curvature, Cc: 1.4

APPENDIX F

Photo Log

Appendix F: Photo Log

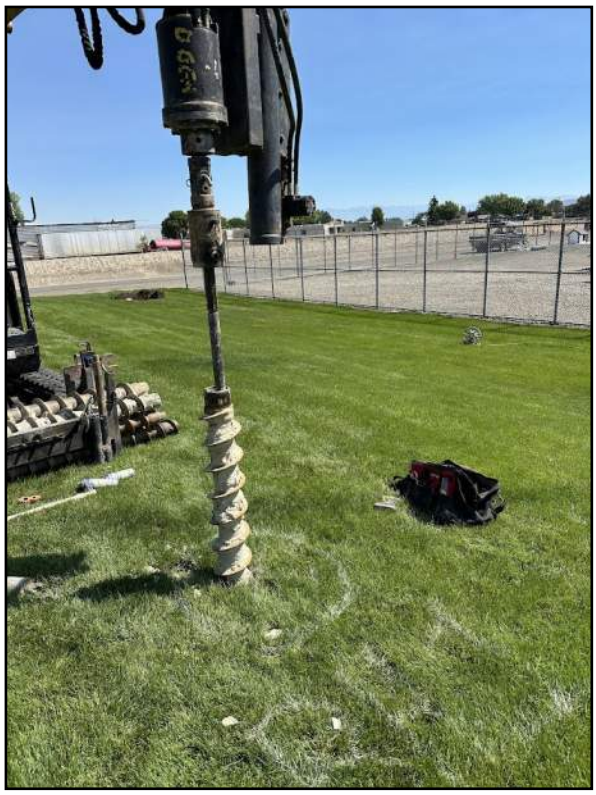


PHOTO 1: BH-1 LOCATION.



PHOTO 2: BH-1 2.5' TO 4.0' BGS. SPT BLOWCOUNTS ARE WOH-WOH-1.



PHOTO 3: BH-1 5.0' TO 6.5' BGS. SPT BLOWCOUNTS ARE 1-1-1.



PHOTO 4: BH-1 7.5' TO 9.0' BGS. SPT BLOWCOUNTS ARE 2-2-3.



PHOTO 5: BH-1 10.0' TO 11.5' BGS. SPT BLOWCOUNTS ARE 2-2-2.



PHOTO 6: BH-1 12.5' TO 14.0' BGS. SPT BLOWCOUNTS ARE 15-26-30.



PHOTO 7: BH-1 15.0' TO 16.5' BGS. SPT BLOWCOUNTS ARE 15-20-22.



PHOTO 8: BH-2 LOCATION.



PHOTO 9: BH-2 2.5' TO 4.0' BGS. SPT BLOWCOUNTS ARE 1-1-3.



PHOTO 10: BH-2 5.0' TO 6.5' BGS. SPT BLOWCOUNTS ARE 3-3-4.

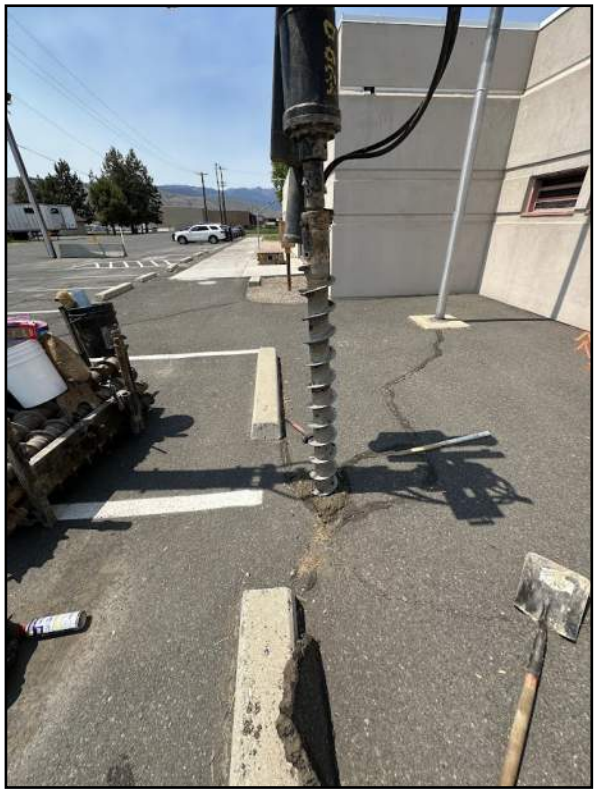


PHOTO 11: BH-3 LOCATION.



PHOTO 12: BH-3 2.5' TO 4.0' BGS. SPT BLOWCOUNTS ARE 1-1-1.



PHOTO 13: BH-3 5.0' TO 6.5' BGS. SPT BLOWCOUNTS ARE 2-1-1.



PHOTO 14: BH-3 6.5' TO 8.0' BGS. SPT BLOWCOUNTS ARE 2-5-5.



PHOTO 15: BH-1 IS ABOUT 5 FEET ABOVE ASPHALT LEVEL.



PHOTO 16: BH-1 LOCATION.

Appendix F: Photo Log



PHOTO 17: HOLE 3 FEET DEEP, 12X24 RING, 10 INCH ABOVE GROUND. 14'' OF EMBEDMENT.



PHOTO 18: START OF PRE-SOAK. 10 ICNHES OF WATER.

PHOTO 19:

PHOTO 20:

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Demolition and removal of selected portions of exterior or interior of building or structure and site elements.
2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 017300 "Execution" for cutting and patching procedures.
4. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
5. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.
6. Section 330500 "Common Work Results for Utilities" for removal of site utility systems piping, equipment, and components.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.
6. Review and finalize protection requirements.
7. Review procedures for noise control and dust control.
8. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

1.6 INFORMATIONAL SUBMITTALS

A. Engineering Survey: Submit engineering survey of condition of building.

B. Survey of Existing Conditions: Submit survey.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Temporary interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials:

1. It is not expected that hazardous materials will be encountered in the Work.

a. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. On-site sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

1. Maintain the existing building structural systems where indicated to remain. Do not demolish such existing construction beyond indicated limits.

2. Maintain the existing interior ceilings, interior partitions, and/or demountable walls where indicated to remain. Do not demolish such existing construction beyond indicated limits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video**,** measured drawings and templates. Comply with Section 013233 "Photographic Documentation."

1. Inventory and record the condition of items to be removed for salvage or reinstallation. Photograph or video conditions that might be misconstrued as damage caused by removal.
2. Photograph or video existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

3.2 PREPARATION

A. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

B. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition

area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location and reinstalled in their original locations after selective demolition operations are complete.

3.3 UTILITY SERVICES AND BUILDING SYSTEMS

A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. If disconnection of utilities and building systems will affect adjacent occupied parts of the building, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to those parts of the building.
3. Demolish and remove existing building systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment and components.

4. Abandon existing building systems, equipment, and components indicated on Drawings to be abandoned in place.

a. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
b. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

5. Remove and reinstall/salvage existing building systems, equipment, and components indicated on drawings to be removed and reinstalled or removed and salvaged:

a. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment and components; when appropriate, reinstall, reconnect, and make equipment operational.
b. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and components and deliver to Owner.

3.4 SALVAGE/REINSTALL

A. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid

marring existing finished surfaces.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and for at least 1 hour after flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete:

1. Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Remove demolition waste materials from Project site and recycle or dispose of them in accordance with Section 017419 "Construction Waste Management and Disposal.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

E. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing materials.
2. Insulating concrete forms.
3. Waterstops

1.2 DEFINITIONS

A. Form-Facing Material: The temporary form materials that come in direct contact with the concrete as part of the formwork components in supporting the concrete while the concrete is setting and gaining sufficient strength to be self-supporting. The most common materials are steel, aluminum, and wood.

B. Form Lining: Materials used to line the concreting face of formwork to impart a smooth or patterned finish to the concrete surface, to absorb moisture from the concrete, or to apply a set-retarding chemical to the formed surface of the concrete.

C. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [**Project site**].

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction, movement, contraction, and isolation joints
c. Forms and form-removal limitations.
d. Shoring and reshoring procedures.
e. Anchor rod and anchorage device installation tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with **ACI 301**.

a. Location of construction joints is subject to approval of Architect.

3. Indicate location of waterstops.
4. Indicate form liner layout and form line termination details.
5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
6. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.

C. Samples:

1. For waterstops.
2. For Form Liners: **12- by 12-inch** sample, indicating texture.

1.5 INFORMATIONAL SUBMITTALS

A. Research Reports: For insulating concrete forms indicating compliance with ICC's Acceptance Criteria AC353.

B. Field quality-control reports.

C. Minutes of preinstallation conference.

D. Qualification Statements: For testing and inspection agency.

1.6 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency,[**acceptable to authorities having jurisdiction,**] qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Mockups: Formed surfaces to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately [**100 sq. ft.**] in the location indicated or, if not indicated, as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Form Liners: Store form liners under cover to protect from sunlight.

B. Insulating Concrete Forms: Store forms off ground and under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Insulated Concrete Forms: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with **ACI 301**, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

a. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with **ACI 301**, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:

a. Wind Loads: As indicated on Drawings.

1) Horizontal Deflection Limit: Not more than [**1/240**] of the wall height.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.

3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-in-Place Concrete, and as follows:

    a. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

        1) APA HDO (high-density overlay).

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces [**with gradual or abrupt irregularities**] not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation, with [**straight**][**or**][**tapered**] end forms.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

2.3 INSULATING CONCRETE FORMS

A. Insulating Concrete Forms: Concrete-forming system complying with ASTM E2634, consisting of two panels of insulation connected with cross ties.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Fox Blocks; Airlite Plastics Co.

2. Insulation: ASTM C578, Type II, expanded polystyrene.

    a. Thickness: Not less than 2-1/2 inches each face.
    b. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

        1) Flame-Spread Index: 25 or less.
        2) Smoke-Developed Index: 450 or less.

3. Cross Ties: Polypropylene, with integral reinforcement supports, designed to

allow passage of concrete during placement.

4. Core Thickness: 8 inches.

2.4 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than **0.022-inch-** thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than **0.034 inch** thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, **3/4 by 3/4 inch**, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. 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.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners to be acceptable to form liner manufacturer.

F. 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.

G. Sealant: One-part moisture cure silicone sealant used with form liners.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with **ACI 301**.

B. Construct formwork, so concrete members and structures are of size, shape, alignment,

elevation, and position indicated, within tolerance limits of **ACI 117** and to comply with the Surface Finish designations specified in Section 033000 "Cast-in-Place Concrete" for as-cast finishes**.**

C. Limit concrete surface irregularities as follows:

1. Surface Finish-2.0: **ACI 117** Class B, **1/4 inch**.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. [**Chamfer**] exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than **12 inches**.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Form Liners: Install per manufacturer's written installation instructions and

recommended tolerances.

M. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.

    a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls **as indicated on Drawings**].

    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

N. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

O. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

P. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

Q. Coat contact surfaces of forms with form-release agent, in accordance with manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in

outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-in-Place Concrete."
4. Secure waterstops in correct position at **12 inches** o.c.
5. Field fabricate joints in accordance with manufacturer's written instructions using heat welding.

    a. Miter corners, intersections, and directional changes in waterstops.
    b. Align center bulbs.

6. Clean waterstops immediately prior to placement of concrete.
7. Support and protect exposed waterstops during progress of the Work.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, in accordance with manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Protect exposed waterstops during progress of the Work.

3.4 INSTALLATION OF INSULATING CONCRETE FORMS

A. Comply with **ACI 301** and manufacturer's written instructions.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of **ACI 117**.

C. Install forms in running bond pattern.

1. Align joints.
2. Align furring strips.

D. Construct forms tight to prevent loss of concrete mortar.

E. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

I. Shore insulating concrete forms to ensure stability and to resist stressing imposed by construction loads.

3.5 REMOVING AND REUSING FORMS

A. 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.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved[**at least 70 percent of**] its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.6 INSTALLATION OF SHORING AND RESHORING

A. Comply with **ACI 318** and **ACI 301** for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a **special inspector and qualified testing and inspecting agency** to perform field tests and inspections and prepare test reports.

B. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections.

C. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

D. Prepare test and inspection reports.

END OF SECTION 031000

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Steel reinforcement bars.
   2. Welded-wire reinforcement.

B. Related Requirements:
   1. Division 03 Section “Concrete Forming and Accessories.”
   2. Division 03 Section “Cast-In-Place Concrete.”
   3. Division 03 Section "Concrete Paving" for reinforcing related to concrete pavement and walks.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review the following:
      a. Special inspection and testing and inspecting agency procedures for field quality control.
      b. Construction contraction and isolation joints.
      c. Steel-reinforcement installation.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Each type of steel reinforcement.
   2. Zinc repair material.
   3. Bar supports.
   4. Mechanical splice couplers.
   5. Structural thermal break insulated connection system.

B. Shop Drawings: Comply with ACI SP-066:
   1. Include placing drawings that detail fabrication, bending, and placement.
   2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of

mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of the Architect.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For testing and inspection agency.

B. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:
   a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
2. Mechanical splice couplers.

D. Field quality-control reports.

E. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

C. Mockups: Reinforcing for cast-concrete formed surfaces, to demonstrate tolerances and standard of workmanship.

1. Build panel approximately 100 sq. ft. for formed surface in the location indicated on Drawings or, if not indicated, as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1. Store reinforcement to avoid contact with earth.
2. Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
3. Do not allow stainless steel reinforcement to come into contact with uncoated reinforcement.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Structural Performance of Structural Thermal Break Insulating Connection System: Structural thermal break insulated connection system shall withstand the following loads and stresses:
   1. Dead Loads: As indicated on Drawings.
      a. Shear Load: As indicated on Drawings.
      b. Bending Moment: As indicated on Drawings.
   2. Live Loads: As indicated on Drawings.
      a. Shear Load: As indicated on Drawings.
      b. Bending Moment: As indicated on Drawings.

B. Seismic Performance of Structural Thermal Break Insulated Connection System: Structural thermal break Insulated connection system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Component Importance Factor: 1.0.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

C. Headed-Steel Reinforcing Bars: ASTM A970/A970M.

D. Galvanized Reinforcing Bars:
   1. Steel Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed bars.
   2. Zinc Coating: ASTM A767/A767M, Class I zinc coated after fabrication and bending.

E. Dual-Coated Reinforcing Bars: ASTM A1055/A1055M.
   1. Steel Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed bars.
   2. Zinc Coating: ASTM A1055/A1055M Type I.

F. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.03 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
   1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
      a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
      b. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
      c. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

C. Mechanical Splice Couplers: ACI 318 (ACI 318M) Type 1, same material of reinforcing bar being spliced; mechanical-lap type.

D. Structural Thermal Break Insulated Connection System:
   1. Tension Rods: Carbon steel with crimped Type 316 stainless steel rods.
   2. Shear Reinforcement Rods: ASTM A276/A276M, Type 316 stainless steel tube.
   3. Pressure pads: ASTM A276/A276M, Type 316 stainless steel.
   4. Insulation body: Polystyrene.

E. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
   1. Finish: Plain.

F. Zinc Repair Material: ASTM A780/A780M.

2.04 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection of In-Place Conditions:
   1. Do not cut or puncture vapor retarder.
   2. 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.

3.02 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.
   1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
   2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.
   1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
   2. Stagger splices in accordance with ACI 318 (ACI 318M).
   3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
   4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

G. Install structural thermal break insulated connection system in accordance with manufacturer's instructions.

H. Install welded-wire reinforcement in longest practicable lengths.
   1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
      a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
   2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
   3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
   4. Lace overlaps with wire.

3.03 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement.
   2. Continue reinforcement across construction joints unless otherwise indicated.
   3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. 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.

3.04 INSTALLATION TOLERANCES

A. Comply with ACI 117 (ACI 117M).

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:
   1. Steel-reinforcement placement.
   2. Steel-reinforcement mechanical splice couplers.
   3. Steel-reinforcement welding.

END OF SECTION 03 20 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
   1. Division 03 Section "Concrete Forming and Accessories" for form-facing materials, and waterstops.
   2. Division 03 Section "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
   4. Division 07 Section "Vapor Retarders" for underslab vapor barrier.
   5. Division 09 Section "Vapor Control for Flooring" for fluid applied concrete floor sealer for control of moisture vapor transmission and alkalinity.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete Subcontractor.
      e. Special concrete finish Subcontractor.
   2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.
d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold and hot weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Methods for achieving specified floor and slab flatness and levelness.
k. Floor and slab flatness and levelness measurements.
l. Concrete repair procedures.
m. Concrete protection.
n. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
o. Protection of field cured field test cylinders.

1.05 ACTION SUBMITTALS

A. Product Data: For each of the following.
1. Portland cement.
2. Fly ash.
3. Aggregates.
4. Admixtures:
a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
5. Fiber reinforcement.
6. Sub-slab membrane/vapor retarders.
7. Liquid floor treatments.
8. Curing materials.
9. Joint fillers.
10. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:
1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Synthetic micro-fiber content.

10. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
11. Intended placement method.
12. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
a. Location of construction joints is subject to approval of the Architect.

1.06 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Bonding agents.
6. Adhesives.
7. Sub-slab membrane/vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

B. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

C. Minutes of preinstallation conference.

1.07 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

B. Field Quality Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

C. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
1. Slab-On-Grade: Build panel approximately 15 feet by 15 feet in the location indicated or, if not indicated, as directed by Architect.
a. Divide panel into four equal panels to demonstrate saw joint cutting.
2. Slab-On-Grade to Receive Polished Finish: Build panel approximately 15 feet by 15 feet in the location indicated or, if not indicated, as directed by Architect.
a. Divide panel into four equal panels to demonstrate saw joint cutting.

3. Formed Surfaces: Build panel approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Slab Moisture Content: Meet relative humidity (RH) maximum of 75% per ASTM F2170. Note that this RH threshold may be exceeded only if permitted and approved in writing by manufacturer of flooring adhesive used in Division 9 floor covering specifications. Verify and comply with RH requirements of all flooring covering types of Division 9.
   1. Conduct slab pre-installation meeting to review procedures to minimize slab moisture problems. Do so prior to slab installation.
   2. Assume full responsibility to ensure that concrete slabs are sufficiently dry to the criterion specified herein. Do so by managing the concrete floor slab installation within the minimum standards of these specifications and by augmenting these minimum standards with additional measures as needed. If needed to meet the 75% RH cap, such additional measures shall include, but are not limited to:
      a. Minimizing slump and water/cement ratio to reduce initial moisture content of slabs.
      b. Introducing super-plasticizers in slabs in lieu of water to minimize initial moisture content.
      c. Protecting slab substrate from precipitation or other moisture sources prior to slab pour. (This measure has its acknowledged practical limitations, and there is no requirement to keep this substrate absolutely dry. Instead this is a recommendation to avoid pouring slabs on wet substrate when obvious adverse conditions exist— such as after a heavy downpour of rain, or with significant standing water or for other reasons—but defer to the contractor's judgment about means and methods and ultimately rely on the contractor's discretion as to the most cost-effective way to achieve the end result.)
      d. Protecting slabs from water spills, clean-up water, rainwater, and other precipitation to avoid resaturation of slabs. (This measure has its acknowledged practical limitations, and there is no requirement to keep the slab absolutely dry. Instead this is a recommendation to minimize post-curing moisture to the greatest practical extent, but defer to the contractor's judgment about means and methods and ultimately rely on the contractor's discretion as to the most cost-effective way to achieve the end result.)
      e. Providing heat mats, dehumidifiers, and other mechanical means to ensure bake-out of slab moisture. Do not use unvented propane heaters which increase relative humidity.
      f. Where feasible under carpeting, do not hard trowel the floor as smooth as would be required for resilient flooring. This recognizes that hard troweling tends to seal in moisture. But it also requires that the carpet substrate be sufficiently smooth so as not to telegraph any irregularities through to the carpet surface.
      g. Other means acceptable within the bounds of this specification's minimum standards or other proposed alternative means not contemplated within these specifications provided that the Owner is notified of such other proposed alternative means and the Owner takes no exception to same.

3. Commence dry-out management efforts after initial wet cure procedures are complete, and after the risk of adverse effects from too hasty curing has expired.
4. During the course of the project, regularly monitor slab moisture content and chart the moisture trends at least a monthly interval after initial slab cure. Report the findings of same to the Owner. If slab moisture content trends suggest excessive moisture that will jeopardize timely installation of floor covering, increase the monitoring interval to at least every two weeks and remediate the situation with mechanical means as needed (including heat mats, dehumidifiers, and other such means).

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.09 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. 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.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. 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 and ACI 305.1, and as follows:
1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.02 CONCRETE MATERIALS

A. Source Limitations:
1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.

3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:
1. Portland Cement: ASTM C150/C150M, Type I or II, gray.
2. Fly Ash: ASTM C618, Class C or F.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 1 inch nominal unless noted otherwise on the structural Drawings or schedule of concrete mixtures in this Section.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures 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. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
2. ~~Crack-Reducing Admixture: ASTM C494/C494M, Type S, producing a 10-fold reduction in incidence and size of cracks compared to plain concrete or conventional shrinkage-reducing admixtures, when tested in accordance with ASTM C 1581.~~
   a. ~~Basis of Design Product: Subject to compliance with requirements, provide BASF Corporation MasterLife CRA 007 or comparable product by another manufacturer.~~

F. Synthetic Fiber: Polyolefin micro- ~~and macro~~ fibers engineered and designed for use in concrete, complying with ASTM C1116/C1116M, Type III, up to 2 inches long. Invisible in final condition using finish method specified.
1. Basis of Design Product: Subject to compliance with requirements, provide **ABC Polymer Industries, LLC; FiberForce 100** ~~BASF Corporation MasterFiber MAC 360 FF~~ or comparable product by another manufacturer.
   a. ~~Hybrid fiber blend of~~ synthetic micro- ~~and macro~~ fibers.

G. Water and Water Used to Make Ice: ASTM C94/C94M, potable complying with ASTM C1602/C1602M, including all limits listed in Table 2 and the requirements of paragraph 5.4.

2.03 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, except with maximum water-vapor permeance of 0.01; not less than 15 mils thick.
1. Include manufacturer's recommended accessories, including but not limited to:
   a. Adhesive or pressure-sensitive tape.
   b. Mastic.
   c. Perimeter or edge seal.
   d. Double-sided adhesive strip or termination bar.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Fortifiber Building Systems Group.
   b. Raven Industries, Inc.
   c. Stego Industries, LLC.
   d. W.R. Meadows, Inc.
3. Refer to Division 07 Section "Vapor Retarders" for underslab vapor barrier.

2.04 LIQUID FLOOR TREATMENTS

A. Concrete Sealer Hardener (SH) for for Exposed Concrete Slabs to be Sealed:
   1. Liquid Densifier and Sealer for Concrete: Clear, chemically reactive, waterborne solution of inorganic non-yellowing silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, densifies, and seals concrete surfaces. The compound must contain a minimum solids content of 20% of which 50% is siliconate.
      a. Basis of Design Product: Euclid Chemical Company (The); Euco Diamond Hard, Liquid Densifier and Sealer for Concrete, or comparable product such as one of the following:
         1) Burke by Edoco; Titan Hard.
         2) ChemMasters; Chemisil Plus.
         3) Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior company; Intraseal.
         4) Curecrete Distribution Inc,; Ashford Formula.
         5) L&M Construction Chemicals, Inc.; Seal Hard.
         6) Meadows, W.R., Inc; Liqui-Hard.
         7) Nox-Crete Products Group, Kinsman Corporation; Duranox.

B. For Concrete Slabs To Receive Finish Flooring: Refer to Division 09 Section "Vapor Control for Flooring" for fluid applied concrete floor sealer for control of moisture vapor transmission and alkalinity.

2.05 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
   1. Color:
      a. Ambient Temperature Below 50 deg F: Black.
      b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
      c. Ambient Temperature Above 85 deg F: White.

B. Water: Potable or complying with ASTM C1602/C1602M.

C. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ChemMasters, Inc.

b. Dayton Superior.
c. Euclid Chemical Company (The); an RPM company.
d. Laticrete International, Inc.
e. W.R. Meadows, Inc.

2.07 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Floor Slab Protective Covering: Eight-feet- wide cellulose fabric.

E. Non-Shrink Grout: CRD-C 621, non-metallic, factory pre-mixed grout; minimum compressive strength of 7,000 psi at 28 days.

2.08 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C150/C150M Portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
   1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.09 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, in accordance with ACI 301.
   1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
   2. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash or Other Pozzolans: 25 percent by mass.
   2. Slag Cement: 50 percent by mass.
   3. Silica Fume: 10 percent by mass.
   4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
   5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
   1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.

2. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
   1. Daily access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
   4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
   1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
   3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.04 INSTALLATION OF SUBSLAB MEMBRANE / VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
   1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
   2. Face laps away from exposed direction of concrete pour.
   3. Lap vapor retarder over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.
   4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
   5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
   6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
   7. Protect vapor retarder during placement of reinforcement and concrete.
      a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

3.05 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
   1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
   2. Place joints perpendicular to main reinforcement.
      a. Continue reinforcement across construction joints unless otherwise indicated.
      b. Do not continue reinforcement through sides of strip placements of floors and slabs.
   3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Grade: Form weakened-plane control joints, sectioning concrete into areas as indicated. See Floor Pattern Plans for joints at exposed-to-view slabs. If joint pattern is not shown, provide expansion joints not exceeding 15’ in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays). Avoid joint patterns that create re-entrant corners. Limit panel length-to-width ratio to 1.2:1.0. Construct control joints for a depth equal to at least one-fourth of concrete thickness.
   1. Exception(s):
      a. In an effort to minimize slab curl, do not install control joints in slabs under wood athletic flooring; just pour slab monolithically and let the shrinkage cracks happen wherever they occur (eventually covered by wood flooring).
   2. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate grooved tool marks on concrete surfaces.
   3. Sawed Joints: Form control 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; does not dislodge aggregate, and before concrete develops random cracks.
   4. Early-Entry Dry Sawn Joints: Contraction joints formed with power saws equipped with shatterproof abrasive or diamond-rimmed blades designed to saw shrinkage control joints within 2-6 hours of slab set.
      a. Manufacturer: Soff-Cut International, follow manufacturer’s recommendations for cutting and maintenance of cutting equipment. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
      b. Provide a number of Soff-Cut machines with operators, available to keep up with the demand of the concrete curing, so cuts are within time required by concrete cure and Soff-Cut manufacturer’s recommendations.

c. Cut set concrete within a 2-6 hour period, and saw when concrete no-longer ravels under blade cut.
d. Concrete slabs cut late are grounds for Architect's rejection of the slab and Contractor will be required to remove and replace concrete slab at his own expense.

D. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.06 CONCRETE PLACEMENT

A. Before placing concrete verify that installation of formwork, reinforcement and embedded item installation is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies at least 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. 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.
1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
a. Do not use vibrators to transport concrete inside forms.
b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.

c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.07 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:
1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
b. Remove projections larger than 1 inch.
c. Tie holes do not require patching.
d. Surface Tolerance: ACI 117 Class D.
e. Apply to concrete surfaces not exposed to public view.
2. ACI 301Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
b. Remove projections larger than 1/4 inch.
c. Patch tie holes.
d. Surface Tolerance: ACI 117 Class B.
e. Locations: Apply to concrete surfaces or to be covered with a coating or covering material applied directly to concrete.
3. ACI 301 Surface Finish SF-3.0:
a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
b. Remove projections larger than 1/8 inch.
c. Patch tie holes.
d. Surface Tolerance: ACI 117 Class A.
e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish.

B. Rubbed Finish: Apply the following to as cast surface finishes where the finished condition will be exposed to view:
   1. Grout-Cleaned Rubbed Finish:
      a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
      b. Do not clean concrete surfaces as Work progresses.
      c. Mix 1 part Portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white Portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
      d. Wet concrete surfaces.
      e. 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.
      f. Maintain required patterns or variances as shown on Drawings or to match mockups.

C. Related Unformed Surfaces:
   1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
   2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.08 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:
   1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
   2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
   3. Apply scratch finish to surfaces to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:
   1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power- driven floats or by hand floating if area is small or inaccessible to power-driven floats.
   2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
   3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.

4. For slabs to receive polished or burnished finish, allow concrete to set to a point where a 200 lbs load over a 0.5 square foot area (roughly equivalent to a footprint) leaves a 1/8 inch depression, before proceeding with troweling.

D. Trowel Finish:
   1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
   2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
   3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   4. Do not add water to concrete surface.
   5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
   6. 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.
   7. For slabs to receive polished or burnished finish, power trowel with pans until machine is working hard, and switch to finish blades on the final pass, to ensure fibers are buried in the cement paste.
   8. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
      a. Slabs on Grade:
      b. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
         1) Typical Slabs to Receive Finish Flooring: Specified overall values of flatness, FF 35; and of levelness, FL 25; with minimum local values of flatness, FF 24; and of levelness, FL 17.
         2) Slabs to Receive Polished or Burnished Finish: Specified Overall Value (SOV): FF 50 and FL 30 with minimum local value (MLV): FF 35 and FL 20.
         3) Slabs to Receive Wood Athletic Flooring: Meet requirements of gym flooring manufacturer, and lot less than the following:
            a) Specified Overall Value (SOV): FF 25 and FL 20 with minimum local value (MLV): FF 17 and FL 15.
      c. Elevated Slabs:
         1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
         2) Typical Slabs to Receive Finish Flooring: Specified overall values of flatness, FF 30; and of levelness, FL 25; with minimum local values of flatness, FF 24; and of levelness, FL 17.

E. 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 perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.09 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:
1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
   1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
   2. If forms remain during curing period, moist cure after loosening forms.
   3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
      a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
      b. Continuous Sprinkling: Maintain concrete surface continuously wet.
      c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
      d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
      e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
         1) Recoat areas subject to heavy rainfall within three hours after initial application.
         2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
   1. Begin curing immediately after finishing concrete.
   2. Interior Concrete Floors:
      a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
         1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
            a) Lap edges and ends of absorptive cover not less than 12-inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but 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.
            a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            b) Cure for not less than seven days.
         3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
            a) Water.
            b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
   1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
      a) Lap edges and ends of absorptive cover not less than 12 inches.
      b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but 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.
      a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
      b) Cure for not less than seven days.
   3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
      a) Water.
      b) Continuous water-fog spray.

c. Floors to Receive Polished or Burnished Finish: Contractor has option of the following:
   1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
      a) Lap edges and ends of absorptive cover not less than 12 inches.
      b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
   2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
      a) Water.
      b) Continuous water-fog spray.

d. Floors to Receive Curing Compound:
   1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
   2) Recoat areas subjected to heavy rainfall within three hours after initial application.
   3) Maintain continuity of coating, and repair damage during curing period.
   4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment (Sealer): Apply to slabs indicated to receive sealer in Drawings.
   1. Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
      a. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
      b. Do not apply to concrete that is less than seven days' old.
      c. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
      d. Rinse with water; remove excess material until surface is dry.
      e. Apply a second coat in a similar manner if surface is rough or porous.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month(s).
   2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete:
   1. Repair and patch defective areas when approved by Architect.
   2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. 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.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch.
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.
e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement, so that, when dry, patching mortar matches surrounding color.
   a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
   b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:
1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
   a. Correct low and high areas.
   b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including 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.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
   a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
   a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
   a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
   b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
   a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.

b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
d. Place, compact, and finish to blend with adjacent finished concrete.
e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
   a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
   b. Dampen cleaned concrete surfaces and apply bonding agent.
   c. Place patching mortar before bonding agent has dried.
   d. Compact patching mortar and finish to match adjacent concrete.
   e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
   1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
   2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
   3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
      a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
         1) Project name.
         2) Name of testing agency.
         3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
         4) Name of concrete manufacturer.
         5) Date and time of inspection, sampling, and field testing.
         6) Date and time of concrete placement.
         7) Location in Work of concrete represented by samples.

8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:
1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with 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.
a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
a. 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.
b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; .
a. 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 C1064/C1064M:
a. 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 C567/C567M fresh unit weight of structural lightweight concrete.
a. 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 C31/C31M:
   a. Cast and laboratory cure two sets of two 6-inch by 12-inch or three 4-inch by 8-inch cylinder specimens for each composite sample.
   b. Cast, initial cure, and field cure two sets of two three standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
   a. Test one set of two three laboratory-cured specimens at seven days and one set of two specimens at 28 days.
   b. Test one set of two three field-cured specimens at seven days and one set of two specimens at 28 days.
   c. 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 if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
    a. 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.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
       1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

A. Protect concrete surfaces as follows:
   1. Protect from petroleum stains.

2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished or burnished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 30 00

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel materials.
2. Shrinkage-resistant grout.
3. Shear stud connectors.

B. Related Requirements:

1. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.
2. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.
3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting requirements.

1.2 DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

See the Evaluations for information about what items are and are not classified as structural steel in ANSI/AISC 303.

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

ANSI/AISC 341 requires that structural Drawings show locations of demand-critical welds, which must comply with additional quality and toughness requirements.

B. Demand-Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the seismic-load-resisting system and which are indicated as "demand critical" or "seismic critical" on Drawings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Slide bearings.
8. Prefabricated building columns.
9. Shop primer.
10. Galvanized-steel primer.
11. Etching cleaner.
12. Galvanized repair paint.
13. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members not to be shop primed.

C. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

A. Qualification Data: For **Installer, fabricator**][**shop-painting applicators**][**professional engineer**][**testing agency**].

B. Welding certificates.

Consider retaining "Paint Compatibility Certificates" Paragraph below if primers are fully specified in this Section rather than in painting Sections.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

Coordinate first paragraph below with qualification requirements in Section 014000 "Quality Requirements."

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:

Revise list below to suit Project. Insert alternative design bolts if required.

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.
5. <**Insert product**>.

F. Survey of existing conditions.

Retain "Source quality-control reports" Paragraph below if Contractor is responsible for source quality-control testing and inspecting.

G. Source quality-control reports.

Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control testing and inspecting.

H. Field quality-control reports.

1.6 QUALITY ASSURANCE

Retain "Fabricator Qualifications" Paragraph below if certification or accreditation of fabricator is required. AISC's Category BU is for steel building structures; other categories in fabricator certification program are for bridges. Before retaining, verify availability of fabricators with IAS accreditation in Project area.

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

Retain one or more of first four subparagraphs below. If more than one subparagraph is applicable, distinguish connections that belong to each subparagraph on the Drawings. Connection design practices among structural engineers vary nationwide; subparagraphs below are alternatives recognized by ANSI/AISC 303.

Retain "Option 1" Subparagraph below if the completed connection designs are shown on the Drawings.

1. Option 1: Connection designs have been completed and connections indicated on the Drawings.

Retain "Option 2" Subparagraph below if the fabricator is responsible for selecting and completing each connection.

2. Option 2: Fabricator's experienced steel detailer selects or completes connections in accordance with ANSI/AISC 303.

    a. Select and complete connections using [**schematic details indicated**][**and**][**ANSI/AISC 360**]<**Insert source**>.
    b. Use [**Load and Resistance Factor Design; data are given at factored-load level**][**Allowable Stress Design; data are given at service-load level**].

Retain "Option 3 and 3A" Subparagraph below if connection design is delegated to fabricator's qualified professional engineer and member reinforcement at connections is shown on the Drawings.

3. Option 3 and 3A: Design connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer. Member reinforcement at connections is indicated on Drawings.

    a. Use [**Load and Resistance Factor Design; data are given at factored-load level**][**Allowable Stress Design; data are given at service-load level**].

Retain "Option 3 and 3B" Subparagraph below if connection design and final configuration of member reinforcement at connections is delegated to fabricator's qualified professional engineer.

4. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

    a. Use [**Load and Resistance Factor Design; data are given at factored-load level**][**Allowable Stress Design; data are given at service-load level**].

C. Moment Connections: [**Type PR, partially**][**Type FR, fully**] restrained.

D. Construction: [**Moment frame**][**Braced frame**][**Shear wall system**][**Combined system of moment frame and braced frame**][**Combined system of moment frame and shear walls**][**Combined system of braced frame and shear walls**][**Combined system of moment frame, braced frame, and shear walls**].

2.2 STRUCTURAL-STEEL MATERIALS

Retain "Recycled Content of Steel Products" Paragraph below to specify recycled content if required. An alternative method of requiring recycled content is to retain requirement in Project's Division 01 sustainable design requirements Section that gives Contractor the option and responsibility to determine how recycled content requirements will be met.

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Channels, Angles, S-Shapes: [**ASTM A36/A36M**][**ASTM A572/A572M, Grade 50**][**ASTM A529/A529M, Grade 50**][**ASTM A913/A913M, Grade 50**].

C. Cold-Formed Hollow Structural Sections: [**ASTM A500/A500M, Grade B**][**ASTM A500/A500M, Grade C**][**ASTM A1085/ASTMA1085M**] structural tubing.

Retain "Corrosion-Resisting (Weathering), Cold-Formed Hollow Structural Sections" Paragraph below for corrosion-resisting (weathering) hollow structural sections and indicate locations on Drawings.

D. Corrosion-Resisting (Weathering), Cold-Formed Hollow Structural Sections: ASTM A847/A847M structural tubing.

E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

F. Steel Castings: ASTM A216/A216M, Grade WCB, with supplementary requirement S11.

G. Steel Forgings: ASTM A668/A668M.

H. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

If using more than one description and grade of high-strength bolt in this article, indicate location of each on Drawings.

2.4 FORGED-STEEL STRUCTURAL HARDWARE

A. Clevises and Turnbuckles: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1035.

B. Eye Bolts and Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1030.

C. Sleeve Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1018.

2.5 PRIMER

A. Steel Primer:

1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
2. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting

primer complying with MPI#79 and compatible with topcoat.

2.6 SHRINKAGE-RESISTANT GROUT

Shrinkage-resistant grouts in "Metallic, Shrinkage-Resistant Grout" and "Nonmetallic, Shrinkage-Resistant Grout" paragraphs below have high compressive strength. For critical installations, require grout manufacturer to provide field assistance to Contractor. Retain first paragraph for heavy-duty grouting applications. Do not use in wet areas or on exterior.

A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

Retain "Nonmetallic, Shrinkage-Resistant Grout" Paragraph below for grouting applications where nonstaining grout is required.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.

Retain subparagraph below if shop priming is required.

5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

Retain option in "Bolt Holes" Paragraph below if permitted. RCSC's "Specification for Structural Joints Using High-Strength Bolts" permits thermally cut bolt holes if approved by engineer of record. Revise standard bolt holes to oversized, short-slotted, or long-slotted bolt holes if permitted, and indicate locations of each type on Drawings.

C. Bolt Holes: Cut, drill, [**mechanically thermal cut,**]or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

Retain "Cleaning" Paragraph below for unpainted structural steel. Delete if shop coating is required and retain applicable requirements in "Shop Priming" Article. Default cleaning in ANSI/AISC 303 describes SSPC-SP 1 solvent cleaning and approximates SSPC-SP 2 hand-tool cleaning.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with [**SSPC-SP 1.**][**SSPC-SP 2.**][**SSPC-SP 3.**]

Retain "Shear Stud Connectors" Paragraph below if shear connectors are shop installed to structural steel.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

Retain "Steel Wall-Opening Framing" Paragraph below if steel wall-opening framing is required and included in this Section.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

Retain "Welded-Steel Door Frames" Paragraph below if structural-steel welded door frames attached to structural-steel frame are required. Welded doorframes are usually used in industrial buildings, but they may be used in other types of buildings for large door openings. Coordinate requirements with Drawings.

H. Welded-Steel Door Frames: Build up welded-steel doorframes attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than **10 inches** o.c. unless otherwise indicated on Drawings.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

Delete option in first subparagraph below if allowing thermally cut holes.

1. Cut, drill, or punch holes perpendicular to steel surfaces.[**Do not thermally cut bolt holes or enlarge holes by burning.**]
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes

perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

RCSC requires that joint types be specified in the Contract Documents for most loading conditions. See the Evaluations for a discussion of the joint types in "Joint Type" Subparagraph below, which are the three types RCSC now recognizes. Insert particular bolt-pretensioning method for pretensioned or slip-critical joints if required; RCSC states that each type can provide satisfactory results.

1. Joint Type: [**Snug tightened**][**Pretensioned**][**Slip critical**].

Retain option in "Weld Connections" Paragraph below for "high-seismic applications," as defined in ANSI/AISC 360.

B. Weld Connections: Comply with AWS D1.1/D1.1M[**and AWS D1.8/D1.8M**] for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

Retain subparagraph below if built-up sections are required.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 GALVANIZING

Retain this article if galvanizing of structural steel is required.

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

Revise locations below where galvanizing is required to suit Project. Subparagraph below is an example only; delete and indicate items to be galvanized on Drawings if preferred.

2. Galvanize [**lintels**][**shelf angles**][**and**][**welded door frames**] attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

Retain this article if shop priming is required.

A. Shop prime steel surfaces, except the following:

Retain, revise, or delete any of seven subparagraphs below to suit Project.

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of **2 inches**.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces [**unless indicated to be painted**].
6. Corrosion-resisting (weathering) steel surfaces.
7. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

Retain surface-preparation standards in nine subparagraphs below or revise to suit Project. Subparagraphs are listed from least to most comprehensive surface preparation and from lowest to highest cost. Coordinate minimum surface-preparation requirements with selection of primers, paint, and coating systems. See the Evaluations.

"SSPC-SP 2" and "SSPC-SP 3" subparagraphs below require complete removal of loose rust, mill scale, and paint. SSPC-SP 2 is minimum surface preparation accepted by AISC for painted steel.

1. SSPC-SP 2.
2. SSPC-SP 3.

"SSPC-SP 7 (WAB)/NACE WAB-4" Subparagraph below permits tight residues of rust, mill scale, and coatings to remain.

3. SSPC-SP 7 (WAB)/NACE WAB-4.

"SSPC-SP 14 (WAB)/NACE WAB-8" Subparagraph below exceeds SSPC-SP 7 (WAB)/NACE WAB-4 requirements but is less strict than cleaning specified in SSPC-SP 6 (WAB)/NACE WAB-3.

4. SSPC-SP 14 (WAB)/NACE WAB-8.

"SSPC-SP 11" Subparagraph below requires complete removal of rust, mill scale, and paint by power tools. SSPC-SP 11 uses nonabrasive methods and bridges the gap between the marginal cleaning required in SSPC-SP 2, SSPC-SP 3, and SSPC-SP 7 (WAB)/NACE WAB-4, and the more thorough cleaning required in SSPC-SP 6 (WAB)/NACE WAB-3, SSPC-SP 10 (WAB)/NACE WAB-2, and SSPC-SP 5 (WAB)/NACE WAB-1.

5. SSPC-SP 11.

"SSPC-SP 6 (WAB)/NACE WAB-3" Subparagraph below requires that two-thirds of surface area be free of visible residue.

6. SSPC-SP 6 (WAB)/NACE WAB-3.

"SSPC-SP 10 (WAB)/NACE WAB-2" Subparagraph below requires that 95 percent of surface area be free of visible residue.

7. SSPC-SP 10 (WAB)/NACE WAB-2.

"SSPC-SP 5 (WAB)/NACE WAB-1" Subparagraph below requires complete removal of visible rust, mill scale, paint, and foreign matter.

8. SSPC-SP 5 (WAB)/NACE WAB-1.

"SSPC-SP 8" Subparagraph below requires complete removal of rust and mill scale by acid, duplex, or electrolytic pickling. Pickling is not widely available.

9. SSPC-SP 8.

Retain "Surface Preparation of Galvanized Steel" Subparagraph below if galvanized steel is to be shop primed.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner [**or in accordance with SSPC-SP 16**].

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of **1.5 mils**. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

Retain first subparagraph below if "Priming" Paragraph above does not suffice. Stripe painting adds cost but helps ensure that hard-to-reach areas, such as crevices, inside corners, and welds, are thoroughly coated and that sharp edges receive adequate coverage.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.11 SOURCE QUALITY CONTROL

Retain this article if fabricator's shop testing is required and revise to suit local practices and requirements of authorities having jurisdiction. Consider deleting article if requiring AISC-certified fabricators and if authorities having jurisdiction approve fabrication work without special inspections.

Coordinate with "Fabricator Qualifications" Paragraph in "Quality Assurance" Article.

Retain "Testing Agency" Paragraph below if required. Independent certification may be acceptable to authorities having jurisdiction without further monitoring of plant's quality-control and testing program by Owner.

A. Testing Agency: [**Owner will engage**][**Engage**] a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

RCSC prescribes inspection for snug-tightened joints and testing and inspection for each method of pretensioning joints.

2. Bolted Connections: Inspect[**and test**] shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

Retain applicable nondestructive testing methods in "Liquid Penetrant Inspection," "Magnetic Particle Inspection," "Ultrasonic Inspection," and "Radiographic Inspection" subparagraphs below. Revise to indicate extent of weld inspections if applicable and to insert alternative acceptance criteria to AWS D1.1/D1.1M if required.

a. Liquid Penetrant Inspection: ASTM E165/E165M.
b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E164.
d. Radiographic Inspection: ASTM E94/E94M.

Retain first subparagraph below if shop-welded shear stud connectors are required.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.

Revise first subparagraph below if an actual amount or percentage of shear connectors requires testing.

b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

Retain subparagraph below if required.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

Retain subparagraph below if design of composite or diaphragm construction is based on shoring of structural steel framing. Revise to suit Project.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

Revise requirements in subparagraphs below to suit Project.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. [**Snug-tighten**][**Pretension**] anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.[**Comply with manufacturer's written installation instructions for grouting.**]

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

Review subparagraph below with structural engineer and revise to suit Project. Retain temperature allowances if required.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

Retain option in first paragraph below if thermal cutting is permitted.

F. Do not use thermal cutting during erection[**unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M**].

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

RCSC requires that joint types be specified in the Contract Documents for most loading conditions. See the Evaluations for a discussion of the joint types in "Joint Type" Subparagraph below, which are the three types RCSC recognizes. Insert particular bolt-pretensioning method for pretensioned or slip-critical joints if required; RCSC states that each type can provide satisfactory results.

1. Joint Type: [**Snug tightened**][**Pretensioned**][**Slip critical**].

Retain option in "Weld Connections" Paragraph below for "high-seismic applications," as defined in ANSI/AISC 360.

B. Weld Connections: Comply with AWS D1.1/D1.1M[**and AWS D1.8/D1.8M**] for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

Retain first subparagraph below if required. Indicate locations if limited to certain areas. ANSI/AISC 303 permits backing bars and runoff tabs to remain in place.

2. Remove backing bars or runoff tabs[**where indicated**], back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

Retain "Shear Stud Connectors" Paragraph below if shear connectors are field installed directly to structural steel, not through steel deck.

C. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.5 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:

Retain two subparagraphs below if on-site paint repair is included in this Section. Touchup painting may be unnecessary if building is immediately enclosed and in-service conditions require no permanent paint protection.

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

Retain subparagraph below if touchup painting/priming is required for Project but is not part of the Work of this Section.

2. Cleaning and touchup painting are specified in [**Section 099113 "Exterior Painting."**][**Section 099123 "Interior Painting."**][**Section 099600 "High-Performance Coatings."**]

Retain "Touchup Priming" Paragraph below if touchup painting is required for Project but is not part of the Work of this Section.

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

Retain "Testing Agency" Paragraph below, with or without "Special Inspections" Paragraph above, to identify who performs tests and inspections. If retaining second option in "Testing Agency" Paragraph, retain "Field quality-control reports" Paragraph in "Informational Submittals" Article.

B. Testing Agency: [**Owner will engage**][**Engage**] a qualified testing agency to perform tests and inspections.

RCSC prescribes inspection for snug-tightened joints and testing and inspection for each method of pretensioning joints.

1. Bolted Connections: Inspect[**and test**] bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

Retain first subparagraph below if required.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

Retain applicable nondestructive testing methods in "Liquid Penetrant Inspection," "Magnetic Particle Inspection," "Ultrasonic Inspection," and "Radiographic Inspection" subparagraphs below. Revise to indicate extent of weld inspections if applicable and to insert alternative acceptance criteria to AWS D1.1/D1.1M if required.

1) Liquid Penetrant Inspection: ASTM E165/E165M.
2) Magnetic Particle Inspection: ASTM E709; performed on root pass

and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

3) Ultrasonic Inspection: ASTM E164.

4) Radiographic Inspection: ASTM E94/E94M.

Retain "Shear Stud Connectors" Subparagraph below if field-welded shear stud connectors are required.

3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

Revise subparagraph below if an actual amount or percentage of shear connectors requires testing.

b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes:
   1. Roof deck.
   2. Acoustical roof deck.
   3. Composite floor deck.

B. Related Sections:
   1. Division 03 Section "Cast-in-Place Concrete" for concrete fill.
   2. Division 05 Section "Structural Steel" for shop and field-welded shear connectors.
   3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.03 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.
   2. Acoustical roof deck.

F. Research/Evaluation Reports: For steel deck.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
   2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.06 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 07 Section "Thermal Insulation" to ensure protection of insulation strips against damage from effects of weather and other causes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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. Steel Deck:
      a. ASC Steel Deck
      b. Verco Manufacturing Co.
      c. Or pre-approved prior to Bid only.

2.02 MATERIALS

A. Decking Types:
   1. Type B - Floor/Roof Decking- Regular and Acoustic “B” type deck- 1.5” height.
   2. Type W2 - Floor decking See Structural and Architectural plans for additional information.

2.03 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
   2. Deck Profile: as indicated in Structural Drawings.
   3. Profile Depth: As indicated
   4. Design Uncoated-Steel Thickness: As indicated.
   5. Span Condition: Double span or more.
   6. Side Laps: Per Structural.
   7. End Laps: Flush, telescoped or nested 2 inch laps.

2.06 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
   1. Anchor Locations: Provide anchoring clips and other ceiling attachment devices needed for attaching work specified in Division 09 Sections.

H. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

I. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
   1. Sherwin-Williams Zinc Clad 5 B69A45, or approved.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.03 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
   1. Weld Diameter: 1/2 inch, nominal.
   2. Weld Spacing: Weld edge and interior ribs of deck units per the Structural Drawings.

B. Side-Lap and Perimeter Edge Fastening: Per Structural Drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure. At exterior walls, insulate on interior of closure area. Provide closure at interior and exterior sides with insulation between closures.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Division 07 Sections.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.06 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports.
2. Shelf angles.
3. Metal ships' ladders and pipe crossovers.
4. Metal floor plate.
5. Structural-steel door frames.
6. Miscellaneous steel trim.
7. Metal bollards.
8. Pipe and downspout guards.
9. Cast-iron wheel guards.
10. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
3. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
2. Section 051200 "Structural Steel Framing" for steel framing, supports, door frames, and other steel items attached to the structural-steel framing.
3. Section 077200 "Roof Accessories" for manufactured metal roof walkways and metal roof stairs.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that

are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Fasteners.
3. Shop primers.
4. Shrinkage-resisting grout.
5. Prefabricated building columns.
6. Slotted channel framing.
7. Manufactured metal ladders.
8. Metal ships' ladders and pipe crossovers.
9. Metal bollards.
10. Pipe and downspout guards.
11. Abrasive metal nosings, treads, and thresholds.
12. Cast-iron wheel guards.
13. Metal downspout boots.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
2. Steel girders for supporting wood frame construction.
3. Steel pipe columns for supporting wood frame construction.
4. Prefabricated building columns.
5. Shelf angles.
6. Metal ladders.
7. Metal ships' ladders and pipe crossovers.
8. Metal floor plate and supports.
9. Structural-steel door frames.
10. Miscellaneous steel trim including **steel angle corner guards**, **steel edgings**.
11. Metal bollards.
12. Loose steel lintels.

1.4 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

B. Welding certificates.

C. Research Reports: For post-installed anchors.

D. Delegated design engineer qualifications.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening stainless steel.
2. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, **ASTM A307, Grade A**; with hex nuts, **ASTM A563**; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, **Grade A325**, Type 3, heavy-hex steel structural bolts; **ASTM A563, Grade DH3,** heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts,

ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.3 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting and Section 099123 "Interior Painting."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.

C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20

and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.
3. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.6 METAL BOLLARDS (AND CAST CONCRETE BOLLARD CAPS)

A. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. Top Gard LLC:
2. Or approved equal per Section 01 25 00

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive **3/4-inch** bolts, spaced not more than **6 inches** from ends and **24 inches** o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately **2 inches** larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup

masonry and concrete.

C. Galvanize **and prime** shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with **5/8-by-1-1/2-inch** steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than **10 inches** o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.

1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

C. Galvanize **and prime exterior** steel frames.

D. Prime **exterior** steel frames with **zinc-rich primer.**

2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize **and prime exterior** miscellaneous steel trim.

D. Prime **exterior** miscellaneous steel trim with **zinc-rich primer.**

2.10 METAL BOLLARDS

A. Fabricate metal bollards from **Schedule 80 steel pipe**.

B. Fabricate bollards with **3/8-inch-** thick, **steel stainless steel, ASTM A480/A480M, No. 4 finish** baseplates for bolting to concrete slab. Drill baseplates at all four corners for **3/4-inch** anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Fabricate sleeves for bollard anchorage from steel or stainless steel **pipe** with **1/4-inch-** thick, steel or stainless steel plate welded to bottom of sleeve. Make sleeves not less than **8 inches** deep and **3/4 inch** larger than OD of bollard.

D. Prime steel bollards with **zinc-rich primer.**

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

C. Prime plates with **zinc-rich primer.**

2.12 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than **8 inches** unless otherwise indicated.

C. Galvanize **and prime** loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with **zinc-rich primer.**

2.13 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.14 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items **not indicated to be galvanized** unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with **universal shop primer** unless **zinc-rich primer is** indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with **SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." Or SSPC-SP 3, "Power Tool Cleaning**

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.16 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor shelf angles securely to existing construction with **expansion anchors.**

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure

girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF SHELF ANGLES

A. Install shelf angles as required to keep masonry level, at correct elevation, and flush with vertical plane.

3.4 INSTALLATION OF METAL FLOOR PLATE

A. Install metal floor plates flush with finished surface. Adjust as required to avoid lippage that could present a tripping hazard.

3.5 INSTALLATION OF STRUCTURAL-STEEL DOOR FRAMES

A. Fasten structural steel door frames to the floor slab by means of angle clips and expansion bolts. Anchor door jambs to adjacent construction in accordance with shop drawing details.

3.6 INSTALLATION OF MISCELLANEOUS STEEL TRIM

A. Anchor to concrete construction to comply with manufacturer's written instructions.

3.7 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

1. Do not fill removable bollards with concrete.

B. Anchor bollards to existing construction with **expansion anchors**. Provide four **3/4-inch** bolts at each bollard unless otherwise indicated.

1. Embed anchor bolts at least **4 inches** in concrete.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.8 INSTALLATION OF ABRASIVE METAL NOSINGS, TREADS, AND THRESHOLDS

A. Center nosings on tread widths unless otherwise indicated.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 079200 "Joint Sealants" to provide a watertight installation.

3.9 INSTALLATION OF METAL DOWNSPOUT BOOTS

A. Anchor metal downspout boots to concrete or masonry construction to comply with manufacturer's written instructions.

B. Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.

3.10 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.11 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum **2.0-mil** dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes:
   1. Wood products.
   2. Wood-preservative-treated lumber.
   3. Dimension lumber framing.
   4. Miscellaneous lumber.
   5. Plywood backing panels.

B. Related Sections:
   1. Division 06 Section "Sheathing."

1.03 REFERENCES

A. Lumber Standards: Comply with PS 20 and with applicable rules of respective grading and inspecting agencies for species and products indicated. Comply with AWPA C20 for fire-retardant (exterior and interior exposure) treated lumber, and C2 for preservative pressure treated lumber.

B. Plywood Product Standards: Comply with PS 1 (ANSI A 199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard for type of panel indicated. Comply with AWPA C27 for fire-retardant treated plywood.

C. Erection Standards: Comply with latest non-conflicting rules for framing and fastening requirements of “National Design Specifications for Wood Construction” of AFPA. Comply with applicable guidelines for installation of sheathing per APA “E30M, Design/Construction Guide, Residential & Commercial."

1.04 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.
   3. SPIB: The Southern Pine Inspection Bureau.
   4. WCLIB: West Coast Lumber Inspection Bureau.
   5. WWPA: Western Wood Products Association.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Shop Drawings: Provide blocking plan to include blocking for owner provided items.

1.06 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
   1. Wood-preservative-treated wood.
   2. Powder-actuated fasteners.
   3. Expansion anchors.
   4. Metal framing anchors.

1.07 QUALITY ASSURANCE

A. Reference Structural General Notes for Work in the section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

1.09 PROJECT CONDITIONS

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
   4. Dress lumber, S4S, unless otherwise indicated.

B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Maximum Moisture Content:
   1. Boards: 15 percent.
   2. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2.
   1. Preservative Chemicals: ACQ Preserve by Chemical Specialties, Inc., or approved; non-arsenic, non-chromium type and acceptable to authorities having jurisdiction.
   2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, roof frame details and masonry cavity surrounds at openings, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, and window surrounds, sleepers, blocking, furring, shims, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

2.03 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.
   6. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
   1. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
   2. Northern species; No. 2 Common grade; NLGA.
   3. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

D. Roofing Nailers: Structural- or No. 2-grade lumber or better; kiln-dried Douglas fir, southern pine, or wood having similar decay-resistant properties.

E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.04 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
   2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.05 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Simpson Strong-Tie Co., Inc.; framing anchors or comparable products by one of the following:
   1. KC Metals Products, Inc.
   2. Phoenix Metal Products, Inc.
   3. USP Structural Connectors.
   4. Or approved equal per Section 01 25 00

B. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
   1. Use for interior locations unless otherwise indicated.

D. Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.
   1. Thickness: As indicated on structural Drawings.

E. I-Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
   1. Thickness: As indicated on structural Drawings.

F. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long or as otherwise indicated on structural Drawings.

G. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick or as otherwise indicated on structural Drawings.

H. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
   1. Bolt dimensions as indicated on structural Drawings.

I. Provide miscellaneous framing anchors as indicated.

2.06 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring, Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
   1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

D. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.

J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).

N. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.

O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully 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. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.02 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.

3.04 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim for transparent finish.
2. Interior standing and running trim for opaque finish.
3. Closet and utility shelving.
4. Interior frames and jambs for transparent finish.
5. Interior frames and jambs for opaque finish.
6. Preservative-treated wood material.
7. Miscellaneous materials.
8. Shop priming.
9. Shop finishing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.
2. Section 062023 "Interior Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: None Required

1.4 ACTION SUBMITTALS

A. Product Data:

1. Anchors.
2. Adhesives.
3. Shop finishing materials.

B. Wood-Preservative Treatment:

1. Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. Indicate type of preservative used and net amount of preservative retained.
3. Include chemical-treatment manufacturer's written instructions for finishing treated material and manufacturer's written warranty.

C. Fire-Retardant Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

D. Waterborne Treatments: For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

E. Sustainable Design Submittals:
1. Third-Party Certifications: For each product.
2. Third-Party Certified Life Cycle Assessment: For each product.
3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.

F. Shop Drawings:

1. Include the following:

a. Dimensioned plans, elevations, and sections.
b. Attachment details.

2. Apply AWI Quality Certification Program label to Shop Drawings.

G. Samples: For each exposed product and for each shop-applied color and finish specified.

1. Size:

a. Panel Products: 12 inches by 12 inches.
b. Lumber Products: Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.

H. Samples for Initial Selection: For each type of shop-applied exposed finish.

1. Not Used

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For architectural woodwork manufacturer and Installer.

B. Product Certificates: For the following:

1. Composite wood products.
2. Adhesives.

C. Evaluation Reports: For preservative-treated and fire-retardant-treated wood materials, from ICC-ES.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical interior architectural woodwork as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.

B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

B. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Frames: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

2.2 ARCHITECTURAL WOODWORK

2.3 WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

2.4 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Architectural Woodwork Standards Grade: Custom.

B. Hardwood Lumber:

1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.

2. Wood Moisture Content: 5 to 10 percent.
3. For base wider than available lumber, glue for width. Do not use veneered construction.

C. Softwood Lumber:

1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
2. Wood Moisture Content: 5 to 10 percent.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

A. Architectural Woodwork Standards Grade: Custom

1. Wood Species: Any closed-grain hardwood
2. Wood Moisture Content: 5 to 10 percent.

2.6 CLOSET AND UTILITY SHELVING

A. Architectural Woodwork Standards Grade: Custom.

B. Shelf Material: 3/4-inch veneer-faced panel product with veneer edge banding.

C. Cleats: 3/4-inch panel product.

D. Wood Species: Match species indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.

E. Metal Closet Rods: 1-5/16-inch- diameter, chrome-plated-steel tubes complying with BHMA A156.16, L03131.

F. Metal Rod Flanges: Chrome-plated steel.

G. Wood Finish: Opaque.

2.7 HARDWOOD SHEET MATERIALS

A. Composite Wood Products: Provide materials that comply with requirements of the Architectural Woodwork Standards for each type of interior architectural woodwork and quality grade specified unless otherwise indicated.

1. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.8 PRESERVATIVE-TREATED-WOOD MATERIAL

A. Preservative-Treated-Wood Materials: Provide with water-repellent preservative treatment complying with AWPA N1 (dip, spray, flood, or vacuum-pressure treatment).

1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC)
2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.

B. Extent of Preservative-Treated Wood Materials: Treat interior architectural woodwork in contact with concrete or masonry

2.9 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: Softwood or hardwood lumber, and Fire-retardant-treated softwood lumber where construction is noted as Fire retardant treated, kiln-dried to less than 15 percent moisture content.

1. Preservative Treatment: Provide softwood lumber treated by pressure process, AWPA U1; Use Category UC3b.

a. Provide where in contact with concrete or masonry
b. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
c. Preservative Chemicals: Acceptable to authorities having jurisdiction
d. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee's (ALSC) Board of Review.

2. Fire-Retardant Treatment: Complying with requirements; provide where indicated

B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of

exterior walls and at floors.

D. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

2.10 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

2.11 SHOP PRIMING

A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

B. Interior Architectural Woodwork for Opaque Finish: Shop prime with one coat of wood primer as specified in Section 099123 "Interior Painting."

1. Backpriming: Apply one coat of primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

C. Interior Architectural Woodwork for Transparent Finish: Shop-seal concealed surfaces with required pretreatments and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."

1. Backpriming: Apply one coat of sealer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

2.12 SHOP FINISHING

A. Finish interior architectural woodwork indicated on Drawings at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior architectural woodwork. Apply two coats to end-grain surfaces.

C. Transparent Finish:

1. Architectural Woodwork Standards Grade: Same as item to be finished.
2. Finish System:

   a. 5: Varnish, Conversion.
   b. 7: Vinyl, Catalyzed.
   c. 8: Acrylic Cross Linking, Water Based.
   d. 12: Polyurethane, Water Based.

3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
4. Staining: Match approved sample for color.
5. Sheen: Satin, 31-45][Semigloss, 46-60][Gloss, 61-100] gloss units measured on 60-degree gloss meter in accordance with ASTM D523.

D. Opaque Finish:

1. Architectural Woodworking Standards Grade: [Same as item to be finished.
2. Finish System:

   a. 5: Varnish, Conversion.
   b. 7: Vinyl, Catalyzed.
   c. 8: Acrylic Cross Linking, Water Based.
   d. 12: Polyurethane, Water Based.

3. Color: As selected by Architect from manufacturer's full range.
4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter in accordance with ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Install interior architectural woodwork level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.
2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes in accordance with AWPA M4.

F. Fire-Retardant-Treated Wood: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.

1. Secure with countersunk, concealed fasteners and blind nailing.
2. Use fine finishing nails[or finishing screws] for exposed fastening, countersunk and filled flush with interior architectural woodwork.
3. For shop-finished items, use filler matching finish of items being installed.

H. Standing and Running Trim:

1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
2. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary.
3. Scarf running joints and stagger in adjacent and related members.
4. Fill gaps, if any, between top of base and wall with latex sealant, painted to match wall.
5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

I. Stairs: Securely anchor carriages to supporting substrates.

1. Install stairs with treads and risers no more than 1/8 inch from indicated position.
2. Secure with countersunk, concealed fasteners and blind nailing.
3. Use fine finishing nails for exposed fastening, countersunk and filled flush with wood surface.

J. Railings:

1. Install rails with no more than 1/8 inch in 96-inch variation from a straight line.
2. Stair Rails: Glue and dowel or pin balusters to treads and railings, and railings to newel posts.

    a. Secure with countersunk, concealed fasteners and blind nailing.
    b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with wood surface.

3. Wall Rails: Support rails on wall brackets securely fastened to wall framing.

    a. Space rail brackets not more than 48” o.c.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.

1. Inspection entity is to prepare and submit report of inspection.

3.4 REPAIR

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade.

B. Where not possible to repair, replace defective woodwork.

C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.

1. Fill nail holes with matching filler where exposed.
2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.5 CLEANING

A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION

SECTION 06 64 00 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic sheet paneling.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring for installing plastic paneling.
2. Section 064219 "Plastic-Laminate-Faced Wood Paneling."
3. Section 102600 "Wall and Door Protection" for corner guards installed over plastic paneling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.3 QUALITY ASSURANCE

A. Testing Agency: Acceptable to authorities having jurisdiction

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

A. SECTION INCLUDES

1. This section includes labor, materials and other services necessary to complete vinyl wall coverings.
2. Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.

B. RELATED SECTIONS

1. Section 03300 - Cast-in-Place Concrete: Concrete finishing
2. Section 06100 - Rough Carpentry: Plywood floor sheathing
3. Division 7 - Thermal and Moisture Protection
4. Division 15 – Mechanical

C. REFERENCES

1. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
2. American Society for Testing & Materials (ASTM):
3. ASTM E 84-05 Standard Test Method for Surface Burning Characteristics of Building Materials. CLASS A
4. ASTM D5420 Gardner Impact Exceeds 160 inch pounds
5. Underwriters Laboratories of Canada (ULC)
6. CAN/ULC-S102, Surface Burning Characteristics

D. SYSTEM DESCRIPTION

1. Performance Requirements: Provide Altro Tegulis wall covering which has been manufactured by Altro and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

E. SUBMITTALS

1. Product Data: Submit manufacturer’s current printed product literature, specifications, installation instructions, and field reports in accordance with Section 01330 - Submittal Procedures.
2.
3. Shop Drawings: Submit shop drawings to indicate materials, details, and accessories in accordance with Section 01330 - Submittal Procedures including but limited to the following:
4. Submit a layout diagram indicating the location of each panel and joining method.
5. Samples: Submit duplicate sample pieces of Altro Tegulis material, as well as

accessory pieces in accordance with Section 01330 - Submittal Procedures.

6. Quality Assurance Submittals: Submit the following:

    a. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
    b. Manufacturer's Instructions: Current published manufacturer's installation and maintenance instructions.
    c. Manufacturer's Field Reports: Specified herein.

7. Closeout Submittals: Submit the following:

    a. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
    b. Warranty: Warranty documents specified herein.

F. 1.06 QUALITY ASSURANCE

1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

    a. Experienced installers who have installed similar products, in similar environments.

2. Mock-ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.

    a. Mock-Up Size: Size in coordination with Architect.
    b. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
    c. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

3. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

G. 1.07 DELIVERY, STORAGE & HANDLING

1. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
2. Deliver, store and handle Altro Tegulis wall panels in accordance with Section 01610 - Basic Material Requirements.
3. Deliver materials in manufacturer's original, unopened, undamaged containers

with identification labels intact.

4. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Panels should be stored flat and be pre-conditioned a minimum of 24 hours in ambient temperatures similar to the prevailing operational conditions.
5. Store panels in temperature controlled environments. Leave protective blue film on panel until ready to use.

H. WASTE MANAGEMENT AND DISPOSAL

1. Deposit all packaging materials in appropriate container on site for recycling or reuse.
2. Avoid using landfill waste disposal procedures when recycling facilities are available.
3. Keep all discarded packaging away from children.

I. PROJECT CONDITIONS

1. Temperature Requirements: If storage temperature is below 68F (20C), the Altro Tegulis wall panel must be moved to a warmer place and allowed to reach this temperature before installation. For further information, refer to current Installation Guide.
2. Maintain air temperature and structural base temperature at installation area between 68F (20C) and 80F (27C) for 48 hours before, during and 24 hours after installation.

J. WARRANTY

1. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
2. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
3. Warranty Period for Altro Tegulis shall be 5 years commencing on Date of Substantial Completion, warranty available online at www.altro.com.

K. EXTRA MATERIALS

1. Provide extra materials of product and adhesives in accordance with Section 01780 - Closeout Submittals.
2. Provide [_____] sq.ft ([_____] m2) of each color, pattern and type material required for project for maintenance use.
3. Provide [_____] sq.ft ([_____] m2) of extra materials in one piece and from same production run as installed materials.
4. Clearly identify each wall panel and each container of adhesive.
5. Deliver to Consultant, upon completion of the work of this section and store where directed.

L. MANUFACTURERS

1. Manufacturer: Altro

a. USA: 80 Industrial Way, Wilmington, MA 01887
b. Toll-free: 800.377.5597 Fax: 978.694.0433
c. E-mail: support@altro.com Web Site: www.altro.com.

M. HYGIENIC WALL COVERINGS

1. Altro Tegulis is homogeneous, 100% pure vinyl, extruded, semi-rigid PVCu sheet, no plasticizers or fillers.

a. Acceptable material: Altro Tegulis (measurements and product weights are approximate): Thickness: 0.10" (2.5 mm); Panel Width: 4’ (1.22m) Panel Height: Either 8’2” or 9’ 10.25” (2.5m or 3m); Weight 4’x 8’2” Panel: 24 lbs (10.7 kg); Weight 4’x 9’10.25” Panel: 28 lbs (12.8 kg).

b. PANEL SIZE: 4’ wide x 9’10” (3.0 m) high

2. PATTERN VISUAL: SUBWAY TILE - 4” x 10”
3. PANEL COLOR: URBAN MINERAL

N. 3. INSTALLATION METHOD: (visuals found at www.altro.com)

1. HALF-LAP (wet and dry areas)

O. ACCESSORIES

1. Including but not limited to:

a. Joint Strips: 2-Part Joint Strip (8’ or 10’) – to match panel color
b. Cut-Tile Transition Strip: 1-Part Transition Strip – [G832/25 White only*] Length 98.5”
c. Start and Edge Trims: G833 1-Part [8’/10’ White Only], A833 2-Part [8’/10]’- to match panel color
d. A839/30 Inside Corner Trim: 1-part trim - 10’ lengths – to match panel color where applicable
e. Adhesives: Altro AP600, Altro W39, or Altro W157 as recommended by Altro. Parabond AP 600 is not recommended for use on existing tile substrates. Adhesive selection and trowel notch is determined by substrate and environmental conditions of the application. Refer to Tegulis Installation Guide for appropriate recommendation.
f. Sanitary Sealant Compounds and Tape Adhesion Promoter:

1) Altro Sanitary Sealant – [A806/** color) 10.5 oz Tube
2) Altro W1650.5 Tape Adhesion Promoter – ½ US Gallon

P. SOURCE QUALITY

1. Source Quality: Obtain wall products from a single manufacturer.

Q.

R. PART 3 EXECUTION

S. 3.01 MANUFACTURER'S INSTRUCTIONS

T. A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog, installation instructions and product label instructions for installation.

U. EXAMINATION

1. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

V. SUBSTRATE PREPARATION

1. Walls should be smooth and level. High points must be removed and low points filled with filler intended for the substrate and environmental conditions.
2. Wall tiles must be fixed firmly to the wall. As long as the tile edges do not protrude, you do not have to skim grout joints.
3. Surfaces must be permanently dry and free from all substances that may contribute to adhesive bond failure.
4. Remove loose paint and conduct an adhesive bond test with paint.
5. Exterior walls must be adequately damp-proofed and insulated.
6. Dry wall substrates should be paint ready.

W. PREPARATION

1. All surfaces must be free from dust and cleaned prior to Altro Tegulis installation. The working environment must also be dust free. Failure to comply with these conditions will reduce the bond strength between the adhesive and substrate, and may cause the Altro Tegulis panels to debond.
2. Very absorbent / porous substrates (particularly plaster finishes and unprimed sheetrock) must have a proprietary sealer e.g. PVA primer or similar, applied to the surface a minimum of 12 hours prior to the installation.
3. All electrical switches, power points etc., should be in a first fix / installation state. All electrical equipment should only be moved or altered by a qualified electrician.

4. All plumbing should have pipe-work removed to a first fix or installation state and “tails” left protruding from the substrate. Altro Tegulis panels can then be drilled and slid over the pipe tails. All holes should be drilled 1/8” (3mm) oversize to allow for expansion, then sealed with Altro Sanitary Sealant. Plumbing should always be done by a qualified plumber.
5. Hot pipes and steam pipes should be insulated and a 1/8” to 1/4” (3-6mm) expansion gap should be created when installing panels around these pipes, then sealed with Altro Sanitary Sealant.
6. All pipes, fixing bolts, etc. extending through the Altro Tegulis panels should have a minimum 1/8” (3mm) expansion gap and be sealed using Altro Sanitary Sealant.
7. If fitting to doorframes, these must be in place prior to installation of Altro Tegulis.
8. Prior to installation, it is advisable to complete any painting which comes in contact with Altro Tegulis, as sealant used at junctions is non-paintable.
9. Panels should be stored flat and be pre-conditioned a minimum of 24 hours in ambient temperatures similar to prevailing operational conditions.
10. The panels must be stored on a level flat surface off the ground (risk of condensation on the panels if stored on damp surfaces). Storage on uneven surfaces could cause the panels to distort prior to installation.
11. First, check the room using a 6’ (2 m) level to ensure all walls are flat, paying particular attention to the corners, window reveals, and door entrances. These need to be inspected to ensure they are free of any debris or irregularities, which could prevent the panels laying flat to the substrate after the adhesive has been applied and the panel installed.

X. INSTALLATION

1. Hygienic Wall Installation: Install Altro Tegulis in accordance with the current published Installation Guide. All joints should be joined by approved methods as detailed in the installation guide. Failure to install Altro Tegulis in accordance with recommended procedures will void the Altro Limited Product Warranty.

Y. CLEANING

1. Note: Once all panels and joints are installed, remove protective film and clean all surfaces down with antistatic solution or antistatic wipes. This is required as the panel may have static build up and any dust in the atmosphere will adhere to the surface of the panel.
2. Altro Tegulis can be cleaned with a diluted soap/detergent solution, such as Altro 44 Cleaner.
3. When cleaning the Altro Tegulis surface, we recommend the temperature of water does not exceed 140° F (60° C).
4. Use cleaning materials compliant with USP regulations, including synthetic, non-shedding mops and specified chemical solutions. Manual unidirectional strokes are recommended to avoid spreading contaminants during cleaning process. Sanitized water is also necessary to thoroughly rinse surfaces.
5. To reduce the buildup of static, cleaning the panels with an anti-static solution is recommended.

6. Stubborn stains use AltroClean 44 cleaner or equivalent alkaline cleaner.
7. Specifier Note: If a construction waste separation and disposal workplan is incorporated as part of the project, ensure that this section makes reference to how the excess material can be recycled or otherwise disposed of. Avoid sending construction waste to landfill sites if alternative means of disposal are available.
8. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 071416 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyurethane waterproofing.
2. Accessory waterproofing system materials.
3. Protection course.

B. Related Requirements:

1. Section 071800 "Traffic Coatings" for exposed, fluid-applied membrane with an integral wearing surface.
2. Section 072100 "Thermal Insulation" for below-grade foundation insulation.
3. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
4. Section 079513.16 "Exterior Expansion Joint Cover Assemblies" for exterior expansion-joint assemblies that interface with waterproofing.
5. Section 079513.19 "Parking Deck Expansion Joint Cover Assemblies" for deck expansion-joint assemblies that interface with waterproofing.
6. Section 221423 "Storm Drainage Piping Specialties" for plaza-deck drains.
7. Section 321400 "Unit Paving" for plaza-deck pavers set on setting beds.
8. Section 334600 "Subdrainage" for molded-sheet drainage panels.

1.2 DEFINITIONS

A. Compatible: Material that will not adversely affect adjacent materials, is chemically compatible with adjacent materials, and where required for bond, achieves adhesive compatibility with adjacent materials.

B. Chemical Compatibility: Material that will not break down, deteriorate, degrade, or prematurely fail when in contact with another material. Material that will not cause chemical breakdown, deterioration, degradation, staining, or premature failure of another material.

C. Adhesive Compatibility: Material that will develop bond strength or provide a suitable surface for another material to develop bond strength complying with requirements when in contact with another material.

1.3 COORDINATION

A. Coordinate Work under this Section with adjacent concrete foundation work, including fill, other waterproofing systems, under-slab vapor retarders, under-slab insulation and subdrainage systems.

B. Coordinate requirements for concrete formwork to provide suitable substrate for waterproofing and to minimize penetrations in waterproofing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings:

1. Indicate locations and extent of waterproofing.
2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, expansion-joint conditions, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For the following materials:

1. Cured sample of waterproofing membrane on suitable rigid substrate, 8 by 8 inches.
2. Flashing sheet, 8 by 8 inches.
3. Membrane-reinforcing fabric, 8 by 8 inches.
4. Paver pedestal assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality control reports.

C. Sample warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.7 MOCKUPS

A. Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build mockup for each typical waterproofing installation, including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.

a. Size: 100 sq. ft. in area.
b. Description: Each type of wall installation.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer. Protect stored materials in accordance with manufacturer's written instructions.

B. Remove and replace materials that cannot be applied within their stated shelf life.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.

1. Do not apply waterproofing to frozen, damp, or wet substrates, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
2. Do not apply waterproofing when snow, rain, fog, or mist are present, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Cold-applied, solvent-free, liquid waterproofing membrane, color to match existing ("Concrete Grey")

1. Performance Based Spec: Waterproofing membrane shall have the following properties as determined by laboratory testing:

a. Tensile Strength, ASTM D412: 395 psi.
b. Elongation at break, ASTM D412: 310%.
c. Water Vapor Transmission, ASTM E96 (Method BW): 0.1 perm in.
d. Concrete Adhesion, ASTM C-836: Exceeds.
e. VOC, ASTM D2369: >30 g/L.
f. Magnesium Board Adhesion, ASTM D903: Pass
g. Fire Rating, ASTM E84-01: Class "A"
h. Static & Dynamic Impact Puncture, CAN/CGSB 37-GP-56M: Pass
i. Pin Holing, CAN/CGSB 37.5-89M: No pinholes detected
j. Tensile Properties After Accelerated Weathering, ASTM D63823: Pass
k. Compost Degradation, ISO 16929: Zero degree of degradation
l. Fungi & Mold Growth ASTM D-4300 & ISO 16929: No growth detected 2.

2. Proprietary Based Spec:

a. Hulk System® by Hulk Systems Inc. WSM2: Waterproofing® by Weatherskin Corporation.

2.2 ACCESSORIES

A. Joint Tape: Adhesive backed tape for corners, crack, sills, plates, and joint treatment.

1. 4" WIDE - WATERPOOF ADHESIVE TAPE by WEATHERSKIN CORPORATION.
2. 6" WIDE - WATERPOOF ADHESIVE TAPE by WEATHERSKIN CORPORATION.
3. 16" WIDE - WATERPOOF ADHESIVE TAPE by WEATHERSKIN CORPORATION.

B. Reinforcement Material for High Build Applications, for Rigid Foams / ICF block and use for Panelized Substrates: E-Glass, quartz resin infused, fiber glass reinforcing synthetic textile.

1. HULK SRT® (STRUCTURALLY REINFORCING TEXTILE) by HULK SYSTEMS INC.

C. Magnesium Board Sealer Concrete Epoxy Primer: For use with all magnesium board surfaces.

1. HULK MBS® (MAGNESIUM BOARD SEALER) by HULK SYSTEMS INC.

D. Detailing Rubberized Repair Mastic: For coves, ties, joints, and penetrations.

1. HULK MASTIC® by HULK SYSTEMS INC.

E. Cementitious Concrete Repair Materials: For vertical, horizontal, and overhead surface preparation repairs.

1. WS: PMM® (POLYMER MODIFIED MORTAR) by WEATHERSKIN CORPORATION.
2. WS: PMSL® (POLYMER MODIFIED SELF LEVELER) by WEATHERSKIN CORPORATION.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that concrete has cured and aged for minimum time period as recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits as recommended in writing by waterproofing manufacturer. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates in accordance with waterproofing manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 PRIMING/SEALING

A. Consult technical documents, including Technical Data Sheet (TDS) and Safety Data Sheet (SDS) for HULK MBS® prior to use and ensure all safety, health, environmental, and personal protection equipment requirements are understood. Technical Documents are readily available upon request or online at www.hulksystem.com.TREATMENT OF JOINTS AND CRACKS

B. Condition all components to 60º – 70º F (16º – 21º C) for 24 hours prior to use. DO NOT apply sealer in temperatures exceeding 86º F (30º C) as it is both flammable and combustible at high temperatures.

C. DO NOT use HULK MBS® around sources of flame, spark, or ignition.

D. No mixing is necessary. Apply HULK MBS® with a short nap, lint free roller or a solvent resistant lowpressure sprayer at an approximate thickness 7 mils WFT (wet film thickness) and coverage rate of 250 ft.2 (23.2 m2) per gallon (6.1 m2/L) providing a uniform coverage over the substrate. Recommended tip size for spray applications is a 0.017” – 0.021” orifice with a 10 inch or greater fan size to prevent fingering. Example: 517 tip size or greater.

E. DO NOT attempt to back-roll.

F. Allow HULK MBS® to become tack-free prior to the application of the fluid applied waterproofing membrane, which should take no longer than 30 – 120 minutes dependent on environmental conditions.

G. Ensure material has been stored between 40° - 70° F (4° - 21° C) and has not been allowed to freeze.

H. Mix thoroughly for a minimum of 1 minute using a mechanical mixer at slow speed to ensure a homogeneous material. If air bubbles occur due to excessive mixing speeds, allow product to settle for a minimum of 10 minutes before use.

I. Prepare, treat, rout, and fill joints and cracks in substrate in accordance with waterproofing manufacturer's written instructions and recommendations in ASTM C898/C898M and ASTM C1471/C1471M. Before coating surfaces, remove dust and dirt from joints and cracks in accordance with ASTM D4258.

1. Comply with ASTM C1193 for joint-sealant installation.
2. Apply bond breaker on sealant surface, beneath preparation strip.
3. Prime substrate along each side of joint and apply a single thickness of preparation strip at least 6 inches wide along each side of joint. Apply waterproofing in two separate applications and embed a joint-reinforcing strip in first preparation coat.

J. Install sheet flashing and bond to deck and wall substrates where required in accordance with waterproofing manufacturer's written instructions.

1. Extend sheet flashings for 4 inches onto perpendicular surfaces and items penetrating substrate.

3.4 INSTALLATION OF COLD FLUID-APPLIED WATERPROOFING

A. General: Apply waterproofing in accordance with manufacturer's written instructions and to recommendations in ASTM C898/C898M and ASTM C1471/C1471M.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate at manufacturer's recommended rate and allow it to dry.

D. Unreinforced Waterproofing Membrane Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a minimum dry film thickness of 40 mils.
2. Apply waterproofing to prepared wall terminations and vertical surfaces.
3. Verify manufacturer's recommended wet film thickness of waterproofing every 100 sq. ft..

E. Reinforced Waterproofing Membrane Applications: Mix materials and apply waterproofing by roller, notched squeegee, trowel, or other suitable application method.

F. Cure waterproofing, taking care to prevent contamination and damage to membrane.

3.5 FIELD QUALITY CONTROL

A. Installer Qualifications

1. Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of fluid applied waterproofing membranes.

B. Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing the product.

C. Provide products which comply with all State or Provincial and local regulations controlling use of volatile organic compounds (VOCs).

3.6 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove waterproofing system that does not comply with requirements, repair substrates, and repair or reinstall waterproofing system to a condition free of damage and deterioration at time of Substantial Completion and in accordance with warranty requirements.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

SECTION 07 19 00 - WATER REPELLENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Penetrating water-repellent-anti-graffiti treatments for the following surfaces, as indicated on Drawings:
      a. Cast-in-place concrete.
      b. Precast concrete.
      c. Concrete unit masonry.

B. Related Sections:
   1. Division 03 Section “Cast-In-Place Concrete.”
   2. Division 03 Section “Precast Architectural Concrete.”
   3. Division 04 Section “Unit Masonry.”

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).
   1. ASTM C 140 - Methods for Sampling and Testing Concrete Masonry Units.
   2. ASTM E 96 - Test Methods for Water Vapor Transmission of Materials.
   3. ASTM E 514 - Standard Test Method for Water Penetration and Leakage Through Masonry.
   4. ASTM G 53 - Standard Practice for Operating Light- and Water-Exposure Apparatus for Exposure of Nonmetallic Materials.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.
   1. Review procedures and coordination required between concrete masonry and clear water repellent treatment work and between treatment work and work which could be affected by or affect treatment.
   2. Convene additional pre-installation meeting prior to water repellent treatment application for coordination with work not previously coordinated including joint sealers as needed.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include manufacturer's printed statement of VOC content.
   2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

B. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator.

B. Qualification Data: For Testing Agency.

C. Product certificates: For each type of water repellent.

D. Preconstruction Test Reports: For water-repellent-treated substrates.

E. Field quality-control reports.

F. Sample Warranty: For special warranty.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with minimum five years record of successful in- service experience of clear water repellent treatments manufactured for concrete masonry unit application.

B. Installer Qualifications: Applicator with minimum five years successful experience in projects of similar scope using specified or similar treatment materials and approved by treatment manufacturer.

C. Mockups: Prepare mockups of each required water repellent on each type of substrate required to demonstrate aesthetic effects, for preconstruction testing, and to set quality standards for materials and execution.
   1. Locate mockups in locations that enable viewing under same conditions as the completed Work.
   2. Application: Apply clear water repellent treatment to left side of mock-up and allow to cure prior to application of treatment to right side of mock-up.
      a. Size: 25 sq. ft.
   3. Approval: Proceed with clear water repellent treatment work only after completion of field test application and approval of mock-up.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Field Testing: In presence of water repellent manufacturer's representative.

E. Owner reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

1.08 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing of water repellents on existing substrate assemblies.
1. In addition to verifying performance requirements, use mockups to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrates.
2. Propose changes to materials and methods to suit Project.
3. Notify Architect seven (7) days in advance of the dates and times when mockups will be tested.

1.09 FIELD CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
1. Concrete surfaces and mortar have cured for not less than 28 days.
2. Building has been closed in for not less than 30 days before treating wall assemblies.
3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
5. Rain or snow is not predicted within 24 hours.
6. Not less than seven (7) days have passed since surfaces were last wet.
7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.10 OWNER STOCK

A. Provide five (5) gallons for owner’s future use.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which Manufacturer and Applicator agree to repair or replace materials that fail to maintain water repellency specified in "Performance Requirements" Article within specified warranty period.
   1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Performance: Water repellents shall meet the following performance requirements as determined by preconstruction testing on substrates representing those indicated for this Project.

B. Water Absorption: Minimum 90 percent reduction of water absorption after 24 hours for treated compared to untreated specimens when tested according to the following:
   1. Cast-in-Place Concrete: ASTM C 642.
   2. Concrete Masonry Units: ASTM C 140.
   3. Clay Brick: ASTM C67.

C. Water-Vapor Transmission: Comply with one or both of the following:
   1. Maximum 10 percent reduction water-vapor transmission of treated compared to untreated specimens, according to ASTM E 96/E 96M.
   2. Minimum 80 percent water-vapor transmission of treated compared to untreated specimens, according to ASTM D 1653.

D. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate of treated compared to untreated specimens, according to ASTM E 514/E 514M.

E. Durability: Maximum 5 percent loss of water-repellent performance after 2500 hours of weathering according to ASTM G154 compared to water-repellent-treated specimens before weathering.

F. Chloride-Ion Intrusion in Concrete: NCHRP Report 244, Series II tests.
   1. Reduction of Water Absorption: 80 percent.
   2. Reduction in Chloride Content: 80 percent.

2.02 PENETRATING WATER REPELLENTS

A. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 600 g/L or less of VOCs.
   1. Basis of Design: Subject to compliance with requirements, provide Prosoco, Inc.; Sure Klean Weather Seal; Blok-Guard & Graffiti Control WB 6, or comparable product by the following:
      a. Evonik Corporation/Protectosil.
   2. Performance Data:

a. Form: Clear liquid.
b. Specific Gravity: 0.802.
c. pH: Not applicable.
d. Weight per Gallon: 6.67 pounds.
e. Active Content: 9 percent.
f. Total Solids: 9 percent ASTM D 2369.
g. Flash Point: 100 deg F ASTM D 3278.
h. Freeze Point: Less than minus 22 deg F.

B. Limitations:
1. Not suitable for extremely dense or polished surfaces.
2. Not suitable for asphaltic surfaces.
3. Not recommended for below-grade applications.
4. May darken or enhance the natural color of some surfaces; comply with results of field testing.
5. Will not prevent water penetration through structural cracks, defects or open joints.
6. May damage glass or be difficult to remove; protect glazing in accordance with manufacturer's written instructions.
7. Not recommended for horizontal surfaces.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Manufacturer’s Representative: Provide testing of water repellent to insure that the sealer and graffiti coatings will not harm or discolor masonry surfaces.
1. Provide representative tests on various materials on existing building in the presence of the manufacturer’s representative, Owner and Architect.

B. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in representative locations by method recommended by manufacturer.
2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
4. Verify that required repairs are complete, cured, and dry before applying water repellent.

C. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

3.02 PREPARATION

A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions.

B. Protection: Provide masking or covering for materials which could be damaged by application of clear water repellent treatment.
   1. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.
   2. Coordination with Sealant Joints: Assure treatment compatibility with each type of joint sealer within or adjacent to surfaces receiving clear water repellent treatment.
      a. Coordinate treatment application with joint sealers; where recommended by joint sealer manufacturer, apply treatment after application and cure of joint sealers.
      b. Mask surfaces indicated to receive joint sealers which would be adversely affected by clear water repellent treatment where treatment must be applied prior to application of joint sealers.
   3. Protect glass, glazed products, and prefinished products from contact with water repellent treatment.
   4. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   5. Protect landscape materials with breathing type drop cloths; plastic covers are not acceptable.
   6. Protect adjacent surfaces not intended to receive water repellent.
   7. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

C. Surface Preparation: Prepare substrates in accordance with water repellent treatment manufacturer’s recommendations.
   1. Clean surfaces of dust, dirt and foreign matter detrimental to proper installation of water repellent treatment.

3.03 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended. Coat entire surface of exposed masonry unless otherwise indicated.

C. Stop work at end of day at visual break line.

D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

E. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet for Weather Seal Blok-Guard & Graffiti Control. Refer to the Product Data Sheet for additional information about application of Blok-Guard & Graffiti Control. Do not dilute or alter.

F. Application Instructions: For best results, apply Blok-Guard & Graffiti Control “wet-on-wet” to a visibly dry and absorbent surface.

G. Spray:
   1. Using low pressure spray equipment (<50 psi), saturate the surface in a “wet-on-wet” application from the bottom up, creating a 6-8” rundown below the spray contact point. Avoid excessive overlapping.
   2. Let the first application penetrate the masonry surface for 2 to 3 minutes. For heavily textured and porous surfaces, reapply in same saturating manner to ensure complete coverage of recessed surfaces.
   3. Immediately brush out runs and drips to prevent build up.
      a. Thoroughly saturate the surface. Avoid excessive overlapping.
      b. Brush out runs and drip to prevent buildup.

H. Dense, smooth surfaces:
   1. Apply enough in a single saturating application to completely wet the surface without creating drips, puddles or rundown. Brush out or back roll all runs and drips for uniform appearance. Do not over apply. Over application may cause unacceptable color change. One application is normally enough. Always test for application rate.

3.04 FIELD QUALITY CONTROL

A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
   1. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will perform tests for compliance of water-repellent material with product requirements.
   3. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect.

B. Test a minimum 4 ft. by 4 ft. area on each type of masonry. Use the manufacturer’s application instructions. Let test area protective treatment cure before inspection. Keep test panels available for comparison throughout the protective treatment project.

3.05 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application.

B. Comply with manufacturer's written cleaning instructions.

3.06 KEYNOTE SCHEDULE

A. Products in this Specification Section are cited in the Drawings as KEYNOTES. See PART 2 - PRODUCTS for information on the following keynotes:

1. KEYNOTE DESCRIPTION
   a. 071900.PWR PENETRATING WATER REPELLENT

END OF SECTION

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Extruded polystyrene foam-plastic board.
   2. Molded (expanded) polystyrene foam-plastic board insulation.
   2. Glass-fiber blanket.
   3. Sound-attenuation blankets.
   4. Mineral-wool blanket insulation.
   5. Firestopping insulation.
   6. Spray-applied insulation (insulation for miscellaneous voids).

B. Related Sections:
   1. Division 07 Sections "Penetration Firestopping" and "Joint Firestopping" for additional materials required for firestopping applications.
   2. Section 071353 "Elastomeric Sheet Waterproofing", Section 071416 "Cold Fluid-Applied Waterproofing" for insulated drainage panels installed with plaza deck insulation.
   3. Section 072119 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
   4. Section 075423 "Thermoplastic-Polyolefin (TPO) Roofing” for insulation specified as part of roofing construction.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM).
   1. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   2. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   3. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   4. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation.
   5. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   6. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

7. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
8. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.

B. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

C. EPD: Environmental Product Declaration. A third party verified document that reports environmental data of products based on the Life Cycle Assessment (LCA) and other relevant information, and in accordance with the International Standard ISO 14025 (Type III Environmental Declarations).

D. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 DEFINITIONS

A. Thermal Conductivity (K value): Units of Btu-inch/hour per square foot per degree F.

B. Glass Mineral Wool: Interchangeable with fiber glass, but replacing the term in the attempt to disassociate and differentiate Glass Mineral Wool from the potential health and safety risk of special purpose or reinforcement products that do not meet the bio solubility criteria of insulation made from glass. Rock Mineral Wool will replace the traditional Mineral Wool label. Both are used in lieu of the Mineral Fiber label.

C. UL Environment Formaldehyde Free Verification Requirements: For a product to be verified as formaldehyde free, product samples must have a measured emission factor of less than or equal to 5 $\mu g/m^2h$ at 24 elapsed hours or 3 $\mu g/m^2h$ at 336 elapsed hours. An emission factor of; 5 $\mu g/m^2h$ corresponds to measured chamber concentration of 2.5 $\mu g/m^3$ for a typical building ratio of 0.5 m^2/m^3. This chamber concentration is comparable to, or below typical outdoor air concentrations. This demonstrates that the formaldehyde exposure from products labeled as formaldehyde free will not contribute to airborne formaldehyde concentrations at greater levels than those found in the natural outdoor environment.

D. UL Classified: UL has tested and evaluated samples of the product with respect to certain properties of the product. UL Classifies products to:
1. Applicable UL requirements.
2. Standards for safety.
3. Standards of other National and International organizations.

E. EPD Submittals: As Certified by UL Environment.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct at Project site.
1. Review methods, materials and requirements of building envelope opening perimeter and penetration insulation.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.07 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
   1. Provide test report, produced by an independent laboratory, showing test results that indicate physical properties of the products provided meet or exceed the requirements of this section.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

C. Manufacturer's Certificate: For each product, provide written letter, signed by manufacturers, certifying that products provided meet or exceed specified requirements.

D. Manufacturer's Instructions: Submit the following:
   1. General installation/application instruction.
   2. Environmental conditions required for installation and installation techniques.

E. Qualification Statements:
   1. Installer's/Applicator's: Submit qualification statement including a copy of manufacturer's certificate.

F. Third Party Validation UL Environment Required for Minimum 50% Recycled Content and Formaldehyde Free.

G. EPD Declarations when available.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

B. Formaldehyde Free: 3rd Party Certified with UL Environmental Validation.

C. Mockups:
   1. Construct mock-up of 100 sq ft of insulation exposed in unconditioned space, representing finished work including internal and external corners.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Surface-Burning Characteristics: As determined by testing protocol required to achieve UL Classified rating. Identify products with appropriate markings of Underwriters Laboratories.

1.09 FIELD CONDITIONS

A. Limitations: Proceed with application only when existing and forecasted weather and substrate conditions permit insulation to be installed according to manufacturers' written instructions and warranty requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Deliver, store, and handle material to avoid exposure to sunlight and contact with flammable materials.

C. Store materials in dry, weathertight enclosures.

D. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.01 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD (XPS)

A. Performance Requirements:
   1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   2. Compressive Strength, Minimum psi: 25, per ASTM D1621.
   3. Water Absorption, Maximum Percent by Volume: 0.3, per ASTM C272.
   4. Water Vapor Permeance, Maximum Perm: 1.5, per ASTM E96.
   5. R-Value: Five per inch minimum, per ASTM C 177/C 518 at 40 degrees F.

B. Below Grade Insulation: ASTM C578, Type IV; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.

C. Thickness: As necessary to achieve required R-value of 15 or as otherwise indicated on Drawings.

D. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Dow Chemical Company; STYROFOAM Brand.
      a. Exterior Foundation Drainage and Insulation: Perimate.
      b. Roofing Insulation: Deckmate.

c. Cavity Wall Insulation: Cavitymate.
d. Tunnel Insulation: Highload 60.
2. Owens Corning; Foamular.
3. Kingspan Insulation LLC; GreenGuard.

2.02 SOUND ATTENUATION BLANKETS (SAB)

A. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
a. Surface Burning Characteristics when tested in accordance with ASTM E 84:
1) Maximum flame spread: 25.
2) Maximum smoke developed: 50.
2. Recycled Content: Postconsumer recycled glass content of not less than 50 percent.
3. Application: Refer to Drawings for locations.
4. Sound Transmission Class: See Wall Types for STC rating.

B. Unwrapped, Glass-Fiber Insulation: Black coated, unfaced, complying with ASTM C 553, Type I, Type II, or Type III; not less than 1-lb/cu. ft. density; treated to be nondusting; thickness as indicated on Drawings.
1. Basis of Design Product: Subject to compliance with requirements, provide Owens Corning; Selectsound Black Acoustic Blanket, or comparable products by one of the following:
a. Acoustic Sonic, Inc.
b. CertainTeed Corporation.
c. Johns Manville.

C. Unfaced glass mineral wool acoustical insulation. EPD Certified by UL Environment, complying with ASTM C 665, Type I. Non-combustible when tested in accordance with ASTM E 136.
1. Basis-of-Design Products: Subject to compliance with requirements, provide products by one of the following:
a. Basis of Design: EcoBatt Quiet Therm Insulation by Knauf Insulation or comparable product.

D. FSK Faced Batt Insulation: Reinforced-foil faced; ASTM C665, Type III, faced with foil scrim, foil-scrim kraft (FSK).
1. Basis-of-Design Product: Subject to compliance with requirements, provide Owens Corning ; FS-25. or a comparable product by another manufacturer.
2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
a. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
3. Thickness: As indicated on Drawings.

2.03 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft (FSK).
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Owens Corning ; FS-25. or a comparable product by another manufacturer.
   2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
      a. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
   3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
   4. R-Value and Thickness: As indicated on Drawings.

2.04 FIRESTOPPING INSULATION

A. Firestopping Insulation for Fire Resistive Joint Systems and Through-Penetrations In Rated Assemblies:
   1. Thickness: As indicated on Drawings.
   2. Facing: Unfaced.
   3. Surface Burning Characteristics:
      a. Flame Spread 0.
      b. Smoke Developed 0.

B. Fire-Resistive Joint and Through-Penetration Applications:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Thermafiber, Inc., an Owens Corning Company; Thermafiber Safing Insulation.

C. Insulation for Head of Wall Applications:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Thermafiber, Inc., an Owens Corning Company; Thermafiber Top-Stop Insulation.

2.05 INSULATION FOR MISCELLANEOUS VOIDS

A. General: Fill voids with insulation R-value required for each assembly, roofs and walls, as indicated on Drawings.

B. Insulation For Miscellaneous Voids:
   1. Spray In Foam (SIF); Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
      a. Basis-of-Design Products: Subject to compliance with requirements, at voids greater than 3 inches wide and 2 inches deep, provide DuPont Spray Polyurethane Foam (SPF) Insulation (CM Series), or the following:
         1) BASF Corporation; Spraytite 178.
      b. Basis of Design Products: Subject to compliance with requirements, at voids less than 3 inches wide and 2 inches deep, provide Dupont FROTH-PAK ULTRA Premium Foam Insulation, or comparable product by one of the following:

1) Foam It Green.
2) Tiger Foam.
3) Touch 'n Seal.

2. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I (pneumatic application); with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
   a. Products: Subject to compliance with requirements, Subject to compliance with requirements, provide the following:
      1) Basis of Design: Owens Corning; ProCat Insulation.

2.06 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness securely in position with self-locking washer in place.
   1. Products: Subject to compliance with requirements, products that may be incorporated into the work include:
      a. AGM Industries, Inc.; Series T TACTOO Insul-hangers.
      b. Gemco; Spindle Type.
      c. Or approved.
   2. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   3. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness securely in position with self-locking washer in place.
   1. Products: Subject to compliance with requirements, products that may be incorporated into the work include:
      a. Gemco; 90-Degree Insulation Hangers.
      b. Or approved.
   2. Angle: Formed from 0.030-inch thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
   3. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
   1. Products:
      a. AGM Industries, Inc.; RC150 or SC150.
      b. Gemco; Dome-Cap, R-150 or S-150.
      c. Or approved.
   2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in crawl spaces, ceiling plenums, attic spaces, or in any location where sharp ends of spindles will be exposed to human contact.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 to 3 inches as indicated or otherwise required between face of insulation and substrate to which anchor is attached.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
   1. Products:
      a. AGM Industries, Inc.; TACTOO GPA-72 Adhesive.
      b. Gemco; Tuff Bond Hanger Adhesive.
      c. Or approved.

2.07 ACCESSORIES

A. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.03 INSTALLATION OF BELOW-GRADE INSULATION

A. Installation of Slab Insulation:
   1. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

a. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
b. Stagger multiple layers of insulation.

2. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
   a. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

B. Installation of Foundation Wall Insulation:
   1. Butt panels together for tight fit.
   2. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.04 INSTALLATION ON CONCRETE AND CMU

A. Install insulation on concrete and CMU substrates by adhesively attached, spindle-type insulation anchors, as follows:
   1. Fasten insulation anchors to concrete and CMU substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness and application indicated.
   2. After adhesive has dried, install insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
   3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles. In areas behind bleacher, cut off spindles at locking washers to limit hazard for maintenance personnel in areas behind bleachers.

3.05 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer.
   1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
   2. Press units firmly against inside substrates.
   3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry."

3.06 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
    a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions. Include consideration of the following:
    a. Temperature and humidity of substrate and immediate environment.
    b. Proper ventilation.
    c. Providing non-damaging pressure relief for voids being filled.
    d. Application to clean substrate, free from visible water and ice.
    e. Do not over-fill voids to prevent over-pressurization.
    f. Trim off visible leakage without damaging visible finish surfaces and materials.
    g. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.
3. Fill all voids of framing of opening perimeter and penetrations of building envelope. Items include but are not limited to windows, doors, and storefront systems, louvers, metal deck closures, piping and mechanical equipment penetrations, and electrical items. Provide a thermally insulated building envelope.
4. Coordinate sequencing of installation of insulation materials to allow other trades installation of materials ahead of foam or batt installation.
5. Do not block or inhibit water pathways for drainage including but not limited to weep holes when install opening perimeter and penetration insulation.

3.07 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072413 - POLYMER-BASED EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Polymer-based exterior insulation and finish system (EIFS).

1. EIFS-clad barrier-wall assemblies that are field applied over substrate.
2. Prefabricated panels consisting of EIFS-clad barrier-wall assemblies that are shop applied over sheathing on metal framing.

B. Related Requirements:

1. Section 072419 "Water-Drainage Exterior Insulation and Finish System (EIFS)" for EIFS-clad drainage-wall assemblies.
2. Section 072600 "Vapor Retarders" for wall sheet vapor retarders.
3. Section 072726 "Fluid-Applied Membrane Air Barriers" for fluid-applied, synthetic polymer air barriers applied over sheathing behind EIFS-clad wall assemblies.

C. Products furnished, but not installed, under this Section include connections and other attachment devices for prefabricated panels to be cast in concrete.

1.2 DEFINITIONS

A. Definitions in ASTM E2110 apply to Work of this Section.

B. EIFS: Exterior insulation and finish system(s).

C. IBC: International Building Code.

D. Polymer-Based Exterior Insulation and Finish System: Class PB EIFS, as defined in ASTM E2568.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each EIFS component, trim, and accessory.

B. Sustainable Design Submittals:

C. Shop Drawings: For prefabricated EIFS panels.

1. Include plans, elevations, sections, details of components including build-outs, details of penetrations and terminations, flashing details, joint locations and configurations, lifting points, fastening and anchorage details including mechanical fasteners, and connections and attachments to other work.

D. Samples: For each exposed product and for each color and texture specified, 8 inches square in size.

E. Samples for Initial Selection: For each type of finish-coat color and texture indicated.

1. Include similar Samples of exposed accessories involving color selection.

F. Samples for Verification: 24-inch- square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work, including custom trim, each profile, and an aesthetic reveal.

1. Include exposed trim and accessory samples to verify color selected.
2. Include a typical control joint filled with sealant of color selected, as specified in Section 079200 "Joint Sealants."

G. Delegated Design Submittal: For prefabricated EIFS panels.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates: Signed by EIFS manufacturer, certifying the following:

1. EIFS substrate is acceptable to EIFS manufacturer.
2. Accessory products installed with EIFS, including joint sealants, flashing, water-resistant barriers, trim, whether or not furnished by EIFS manufacturer and whether or not specified in this Section, are acceptable to EIFS manufacturer.

C. Product Certificates: For cementitious materials and aggregates and for insulation, from manufacturer.

D. Product Test Reports: For each EIFS assembly and component, for tests performed by a qualified testing agency.

E. Field quality-control reports.

F. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For EIFS to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is certified in writing by AWCI International as qualified to install Class PB EIFS using trained workers.

B. Fabricator/Erector Qualifications: Certified in writing by EIFS manufacturer as qualified to fabricate and erect manufacturer's prefabricated panel system using skilled and trained workers.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution, and to set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Stack insulation board flat and off the ground.
2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1. Proceed with installation of adhesives or coatings only when ambient temperatures have remained, or are forecast to remain, above 40 deg F for a minimum of 24 hours before, during, and after application. Do not apply EIFS adhesives or coatings during rainfall.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of EIFS that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Bond integrity and weathertightness.
b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.

2. Warranty coverage includes the following EIFS components:

a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
b. Insulation installed as part of EIFS, including buildoutS.
c. Insulation adhesive and mechanical fasteners.
d. EIFS accessories, including trim components and flashing.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. EIFS Performance: Comply with ASTM E2568 and with the following:

1. Weathertightness: Resistant to water penetration from exterior.
2. Structural Performance of Assembly and Components:

a. Wind Loads:

1) Uniform pressure as indicated on Drawings.

3. Impact Performance: ASTM E2568, Standard impact resistance unless otherwise indicated.
4. Abrasion Resistance of Finish Coat: Sample consisting of 1-inch- thick EIFS mounted on 1/2-inch- thick gypsum board; cured for a minimum of 28 days and shows no cracking, checking, or loss of film integrity after exposure to 528 quarts of sand when tested in accordance with ASTM D968, Method A.
5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch clean glass

substrate; cured for 28 days and shows no growth when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.

B. Performance of Prefabricated Panels: EIFS to be designed as follows and withstand the structural performance indicated for Class PB EIFS and thermal movement limits indicated below without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design prefabricated panels, including comprehensive engineering analysis, using performance requirements and design criteria indicated.
2. Structural Performance: EIFS must withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated in accordance with ASCE/SEI 7:

a. Wind Loads:

1) Uniform pressure as indicated on Drawings.

3. Deflection Limits: Design prefabricated panels to withstand design loads without deflections greater than 1/240.
4. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

a. Temperature Change: 100 deg F.

2.2 EIFS MATERIALS

A. Prefabricated Panels: Comply with requirements in Section 054000 "Cold-Formed Metal Framing" for metal framing supporting sheathing beneath EIFS and Section 061600 "Sheathing" for sheathing and sheathing joint treatment.

B. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.

C. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with substrate and complying with one of the following:

1. Job-mixed formulation of portland cement, complying with ASTM C150/C150M, Type I, and polymer-based adhesive specified for base coat.
2. Factory-blended dry formulation of portland cement, dry polymer admixture, and fillers specified for base coat.
3. Factory-mixed noncementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.

D. Molded, (Expanded) Rigid Cellular Polystyrene Board Insulation: Comply with ASTM E2430/E2430M, unless otherwise noted, and the following:

1. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, in accordance with ASTM E84.
2. Dimensions: Provide insulation boards of not more than 24 by 48 inches, with thickness indicated on Drawings.
3. Foam Buildouts: Provide with profiles and dimensions indicated on Drawings.

E. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multi-end strands with retained mesh tensile strength of not less than 120 lbf/in. in accordance with ASTM E2098/E2098M and the following:

1. Reinforcing Mesh for EIFS, General: Not less than weight required to comply with impact-performance level specified in "Performance Requirements" Article.
2. Strip-Reinforcing Mesh: As recommended by EIFS manufacturer.
3. Detail-Reinforcing Mesh: As recommended by EIFS manufacturer.
4. Corner-Reinforcing Mesh: As recommended by EIFS manufacturer.

F. Base Coat: EIFS manufacturer's standard mixture complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
3. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.
4. Factory-mixed noncementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.

G. Water-Resistant Base Coat: EIFS manufacturer's standard waterproof formulation complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.

H. Mechanical Fasteners: EIFS manufacturer's standard corrosion-resistant fasteners, consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; designed to resist Project's design loads; capable of pulling fastener head below surface of insulation board; and complying with the following:

1. For attachment to masonry and concrete substrates, provide sheathing dowel in form of a plastic wing-tipped fastener with thermal cap, sized to fit insulation

thickness indicated and to penetrate substrate to depth required to secure anchorage.

I. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

J. Finish Coat: EIFS manufacturer's standard acrylic-based coating complying with the following:

1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.

a. Aggregate: Marble chips of size and color as indicated by manufacturer's designations.

2. Colors: To match adjacent existing building color.
3. Textures: To match adjacent existing building texture.

K. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.

L. Water: Potable.

M. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D1784 and ASTM C1063.

1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation, with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
3. Expansion Joint: Closed-cell polyethylene backer rod and elastomeric sealant, 3/4-inch minimum.
4. Windowsill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.
5. Parapet Cap Flashing: Type for both flashing and covering parapet top, with design complying with ASTM C1397 and ANSI/SPRI/FM 4435/ES-1.

2.3 MIXING

A. Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials, except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

2.4 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections indicated below and to prepare test reports:

1. Shop welds are subject to testing and inspection.
2. Testing and inspecting agency will interpret tests and report whether tested Work complies with or deviates from requirements.
3. Correct deficiencies in or replace EIFS prefabricated panels that test reports and inspections indicate do not comply with requirements.
4. Additional testing and inspection, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after surfaces are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind EIFS and deterioration of substrates.

C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

1. Concrete Substrates: Provide clean, dry, neutral-pH substrate for insulation installation. Verify suitability of substrate by performing bond and moisture tests

recommended by EIFS manufacturer.

3.3 INSTALLATION OF EIFS, GENERAL

A. Comply with ASTM C1397, ASTM E2511, and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate.

3.4 APPLICATION OF SUBSTRATE PROTECTION

A. Flexible-Membrane Flashing: Apply and lap to shed water; seal at openings, penetrations, and terminations. Prime substrates with flashing primer if required and install flashing.

3.5 INSTALLATION OF TRIM

A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, at windowsills, and elsewhere as indicated. Coordinate with installation of insulation.

1. Drip Screed/Track: Use at bottom edges of EIFS unless otherwise indicated.
2. Windowsill Flashing: Use at windows unless otherwise indicated.
3. Expansion Joint: Use where indicated on Drawings.
4. Casing Bead: Use at other locations.
5. Parapet Cap Flashing: Use where indicated on Drawings.

3.6 INSTALLATION OF INSULATION

A. Board Insulation: Adhesively and mechanically attach insulation to substrate in compliance with ASTM C1397 and the following:

1. Concrete or Masonry: Apply adhesive by ribbon-and-dab method.
2. Press and slide insulation into place. Apply pressure over entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
3. Mechanically attach insulation to substrate. Install top surface of fastener heads flush with plane of insulation. Install fasteners into or through substrates with the following minimum penetration:

    a. Concrete and Masonry: 1 inch.

4. Apply insulation over dry substrates in courses, with long edges of boards oriented horizontally.
5. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.
6. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints, so no piece of insulation is less than 12

inches wide or 6 inches high. Offset joints not less than 6 inches from corners of window and door openings and not less than 4 inches from aesthetic reveals.

a. Adhesive Attachment: Offset joints of insulation not less than 6 inches from horizontal and 4 inches from vertical joints in sheathing.
b. Mechanical Attachment: Offset joints of insulation from horizontal joints in sheathing.

7. Interlock ends at internal and external corners.
8. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
9. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
10. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/16 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch. Prevent airborne dispersal and immediately collect insulation raspings or sandings.
11. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch.
12. Interrupt insulation for expansion joints where indicated.
13. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
14. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.
15. Before installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches over front and back face unless otherwise indicated on Drawings.
16. Treat exposed edges of insulation as follows:

    a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
    b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
    c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.

17. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and EIFS lamina.

B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:

1. At expansion joints in substrates behind EIFS.
2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
3. At floor lines in multilevel wood-framed construction.
4. Where wall height or building shape changes.
5. Where EIFS manufacturer requires joints in long continuous elevations.
6. Where panels abut one another.

3.7 APPLICATION OF BASE COAT

A. Water-Resistant Base Coat: Apply full-thickness coverage to exposed insulation and to exposed surfaces of sloped shapes, window sills, parapets and to other surfaces indicated on Drawings.

B. Base Coat: Apply full coverage to exposed insulation and foam buildouts with not less than 1/16-inch dry-coat thickness.

C. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C1397. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.

D. Double-Layer Reinforcing-Mesh Application: Where indicated or required, apply second base coat and second layer of reinforcing mesh, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C1397 in same manner as first application. Do not apply until first base coat has cured.

E. Additional Reinforcing Mesh: Apply strip-reinforcing mesh around openings, extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip-reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- wide, strip-reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.

1. At aesthetic reveals, apply strip-reinforcing mesh not less than 8 inches wide.
2. Embed strip-reinforcing mesh in base coat before applying first layer of reinforcing mesh.

F. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application, except without reinforcing mesh. Do not apply until first base coat has cured.

3.8 APPLICATION OF FINISH COAT

A. Primer: Apply over dry base coat.

B. Finish Coat: Apply full-thickness coverage over dry primed base coat, maintaining a wet edge at all times for uniform appearance, to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

1. Embed aggregate in finish coat to produce a uniform applied-aggregate finish of color and texture matching approved sample.

C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.9 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. As stipulated in Ch. 17 of the IBC.

B. EIFS will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic polyolefin (TPO) roofing system.
2. Accessory roofing system materials.
3. Substrate board.
4. Vapor retarder.
5. Roof insulation and accessories.
6. Cover board.
7. Electronic leak-detection (ELD) materials.
8. Walkways.

B. Related Requirements:

1. Section 053100 "Steel Decking" for roof deck panels.
2. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 077100 "Roof Specialties" for premanufactured copings, reglets, and counterflashings.
5. Section 077129 "Manufactured Roof Expansion Joints" for premanufactured roof expansion-joint assemblies.
6. Section 077200 "Roof Accessories" for manufactured roof curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
7. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
8. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's " Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing system Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and

installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base and sheet flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Roof plan showing orientation of roof deck and orientation of roofing membrane, fastening spacings, and pattern for corner, perimeter, and field-of-roof locations.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Crickets, saddles, and tapered edge strips, including slopes.
8. Tie-in with adjoining wall system air barrier.

C. Samples for Verification: For the following products:

1. Roofing membrane and flashings, of color required.
2. Walkways, of color required.

D. Wind-Uplift-Resistance Submittal: For roofing system indicating compliance with wind-uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roofing membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

    a. Submit evidence of compliance with specified performance requirements.

2. Special Warranty Certificate: Signed by roofing membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

B. Product Test Reports: For roofing membrane and insulation, tests performed by an independent qualified testing agency indicating compliance with specified requirements.

C. Research Reports: For components of roofing system, from an agency acceptable to authorities having jurisdiction showing compliance with specified performance requirements.

D. Field Test Reports:

1. Concrete internal relative humidity test reports.
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system.

B. Certified statement from existing roofing system manufacturer stating that existing roof warranty has not been affected by the Work performed under this Section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is ULSE listed for roofing system identical to that used for this Project.

B. Roofing System Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1. Certified Roofing System Installer: Entity that employs a supervisor who is an NRCA ProCertified Roofing Foreman or installers who are NRCA ProCertified thermoplastic system installers.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing system materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

1. Protect stored liquid material from direct sunlight.
2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.

1. Store in a dry location.
2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing system materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written installation instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 INSULATION STOPS

A. Material: Solid Softwood Lumber

B. Thickness: Match Insulation

C. Minimum Width: 1-1/2 inches

D. Preservation Treatment: AWPA C-2 using Water-Borne Preservatives

2.2 ROOF INSULATION

A. Manufacturer & Brand: Contractor's choice

B. Insulating Material: Polyisocyanurate Foam

C. Manufacturing Standard: ASTM C-1289, Type II, Class 1

D. Minimum Compressive Strength: 20 psi

E. Facing Material: Coated Fiberglass

F. Type: Free of CFC's & HCFC's

G. Top Surface Shape: Tapered

H. Total Overall Thickness: Minimum Base layer for R-value required plus tapered as required. See Drawings

2.3 INSULATION COVER BOARD

A. Manufacturer & Brand: G-P DensDeck Roof Board, or approved.

B. Thickness: 1/4 inches

C. Flame Spread Rating: 0

D. Smoke Development Rating: 0

E. Maximum ASTM C-473 Water Absorption by weight: 5%

F. Maximum ASTM C-473 Surface Water Absorption: 1 gram

G. Extent of Work: Provide over Thermal Insulation to receive Roofing.

2.4 CRICKET FORMING BOARD

A. Material: Polyisocyanurate Insulation Board, or approved.

B. Manufacturer: Contractor's choice

C. Minimum Density: 1-1/2 pcf

D. Shape: Tapered 1/2 inch per ft., minimum.

E. Extent of Work: Provide where necessary to form Roof Slope Crickets.

2.5 ROOFING MEMBRANE

A. Manufacturer & Brand: Carlisle Sure-Weld, Firestone UltraPly, JM UltraGuard, Stevens

EP, or approved.

B. Material: Reinforced Thermoplastic Polyolefin (TPO)

C. Manufacturing Standard: ASTM D-6878

D. Minimum UL 790 Fire-resistiveness Class: A

E. Color: White

F. Minimum Solar Reflectance Index (SRI) after 3-years Weather Exposure: 0.74

G. Thickness: 60 mils

H. Temporary Protective Film: Carlisle Apeel, or approved.

2.6 FLASHING MEMBRANE

A. Material & Thickness: Recommended by Roofing Membrane Manufacturer for conditions of use.

B. Color: Match Roofing Membrane

2.7 ADHESIVE, CEMENT, MASTIC, & SEALANT

A. Furnished by Membrane Manufacturer.

2.8 NAILING STRIPS, CURBS, & BLOCKING

A. Materials: Recommended by Membrane Manufacturer for conditions of use

B. Source: Furnished by Membrane Manufacturer

2.9 FASTENERS

A. Manufacturer & Type: Approved by Membrane Manufacturer

B. Material: Non-corrosive

C. Length: As required to satisfy conditions of use. Note: If and where underside of Roof Sheathing is exposed to view, provide short Fasteners that will not be visible. \

2.10 TRAFFIC PADS

A. Manufacturer & Brand: Carlisle Walkway Pads, or approved.

B. Approximate Minimum Face Size: 30x30 inches

C. Extent of Work: Provide on Roof surface where shown on Drawings.

2.11 REFLECTIVE COATING

A. Manufacturer & Brand: Contractor's choice

B. Type: Satisfy conditions of use.

C. Minimum Solar Reflectance Rating: 0.65 (initial) & 0.50 (aged)

D. Minimum Remittance Rating: 0.90

E. Color: White

2.12 OTHER MATERIALS

A. Manufacturer & Type: Approved by Membrane Manufacturer

B. Extent of Work: Provide all required for complete weatherproof installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with roofing system Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation in accordance with roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

a. patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING SYSTEM, GENERAL

A. Install roofing system materials and components in accordance with roofing system manufacturer's written installation instructions, SPRI's "Directory of Roof Assemblies" listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

C. Install roofing membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

D. Substrate-Joint Penetrations: Prevent adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.4 INSTALLATION OF ELECTRONIC LEAK-DETECTION (ELD) MATERIALS

A. Install conductive medium directly under roofing membrane in accordance with ASTM D7877 and ASTM D8231.

3.5 INSTALLATION OF TPO ROOFING MEMBRANE

A. Install roofing membrane over roof area for adhered application method in accordance with roofing system manufacturer's written installation instructions.

B. Unroll roofing membrane and allow it to relax before installing.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

D. Adhered Application: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply to splice area of roofing membrane.

1. In addition to adhering, mechanically fasten roofing membrane securely at

terminations, penetrations, and perimeter of roof area.

E. Seams and End Laps: Clean seam areas, overlap membrane, and hot-air-weld side seams and end laps of roofing membrane and sheet flashings to ensure a watertight installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing membrane that do not comply with requirements.

F. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing membrane in place with clamping ring.

3.6 INSTALLATION OF BASE AND SHEET FLASHINGS

A. General: Install and adhere base and sheet flashing and preformed flashing accessories to substrates in accordance with roofing system manufacturer's written installation instructions.

B. Apply bonding adhesive to substrate and underside of flashings at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners.

D. Clean seam areas, overlap, and firmly roll flashings into the adhesive. Hot-air-weld side seams and end laps to ensure a watertight installation.

E. Terminate and seal top of flashings and mechanically anchor to substrate through termination bars.

3.7 INSTALLATION OF WALKWAYS

A. Flexible Walkways: Install walkway products in accordance with manufacturer's written installation instructions.

B. Roof-Paver Walkways: Install walkway roof pavers in accordance with manufacturer's written installation instructions.

1. Install roof-paver walkways at the following locations:

   a. Locations indicated on Drawings.

2. Provide 3 inches of space between adjacent roof pavers.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspect substrate conditions, surface preparation, and installation of roofing membrane, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Tests and Inspections:

1. ELD Testing: Testing agency surveys entire roof area and flashings to locate discontinuities in the roofing membrane using ELD in accordance with ASTM D7877 and ASTM D8231.

a. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.

1) Cost of retesting is Contractor's responsibility.

b. Testing agency to prepare survey report indicating locations of initial discontinuities, if any.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

1. Roofing system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING SYSTEM INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing System Installer," has performed roofing and associated Work on the following Project:

1. Owner: Baker County
2. Owner Address: 3410 K St., Baker, OR 97814.
3. Building Name/Type: Baker County Emergency Operations Center
4. Building Address: 3410 K St., Baker, OR 97814.
5. Area of Work: New addition to the existing Baker County Sheriffs Office of approx.. 3,863 sq. Ft.
6. Warranty Period: Five years from date of Substantial Completion.
7. Date of Substantial Completion: _____.

B. AND WHEREAS Roofing System Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said Work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing System Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period, Roofing System Installer will, at Roofing System Installer's own cost and expense, make or cause to be made such repairs to or replacements of said Work as are necessary to correct faulty and defective work and as are necessary to maintain said Work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to Work and other parts of the building, and to building contents, caused by:

a. lightning;
b. peak gust wind speed exceeding 120 mph;
c. fire;
d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the Work;
f. vapor condensation on bottom of roofing; and
g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When Work has been damaged by any of foregoing causes, Warranty will be null

and void until such damage has been repaired by Roofing System Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing System Installer is responsible for damage to Work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of Work.
4. During Warranty Period, if Owner allows alteration of Work by anyone other than Roofing System Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty will become null and void on date of said alterations, but only to the extent said alterations affect Work covered by this Warranty. If Owner engages Roofing System Installer to perform said alterations, Warranty will not become null and void unless Roofing System Installer, before starting said Work, will have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate Work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty will become null and void on date of said change, but only to the extent said change affects Work covered by this Warranty.
6. Owner will promptly notify Roofing System Installer of observed, known, or suspected leaks, defects, or deterioration and afford reasonable opportunity for Roofing System Installer to inspect Work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing System Installer on said Work and will not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty will not operate to relieve Roofing System Installer of responsibility for performance of original Work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Manufactured Products:
      a. Manufactured through-wall flashing and counterflashing.
      b. Manufactured reglets and counterflashing.
   2. Formed Products:
      a. Formed roof drainage sheet metal fabrications.
      b. Formed low-slope roof sheet metal fabrications.
      c. Formed wall sheet metal fabrications.
      d. Formed equipment support flashing.

B. Related Sections:
   1. Division 05 Section "Metal Fabrications" for cast iron downspouts.
   2. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
   3. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
   4. Division 07 Section "Expansion Joint Covers" for manufactured sheet metal expansion-joint covers.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled works. Details and drawings are to be drafted using CAD drafting. Include the following:
   1. Identification of material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of special conditions.
7. Details of connections to adjoining work.
8. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Sheet Metal flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.
4. Aluminum Samples: Samples to show full range to be expected for each color required.

E. Qualification Data: For qualified fabricator.

F. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

G. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
1. NRCA - Latest Edition of the NRCA Roofing and Waterproofing Manual.

C. Mockups: Build Integrated Exterior Mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build exterior mockup of typical roof edge, approximately 10 feet long, including supporting construction, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.06 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Warranty for Installation: Installer agrees to repair or replace components of sheet metal flashing and trim that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Structural failures, including, but not limited to, rupturing or cracking.
b. Wrinkling or buckling.
c. Loose parts.
d. Failure to remain weathertight, including uncontrolled water leakage.
e. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including nonuniformity of color or finish.
f. Galvanic action between sheet metal roofing and dissimilar materials.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in:
1. Refer to Structural General Notes for Wind Up-Lift tables.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finishes:
a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Colors:
a. As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
1. Finish: as selected by Architect.
2. Surface: Smooth, flat.

D. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
2. Surface: Smooth, flat.
3. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
4. Colors: As selected by Architect from manufacturer's full range.
5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
   3. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
      b. GCP Applied Technologies; Ultra.
      c. Henry Company; Blueskin PE200 HT.

2.04 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
   4. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.

5. Fasteners for Zinc-Coated (Galvanized): Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
2. For Zinc-Tin Alloy-Coated Stainless Steel: ASTM B 32, 100 percent tin.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.05 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Fry Reglet Corporation.
b. Heckmann Building Products Inc.
c. Hickman, W. P. Company.
d. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
e. Sandell Manufacturing Company, Inc.

2. Material: Stainless steel, 0.019 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
6. Accessories:
   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
   b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
7. Finish: As selected by Architect.

2.06 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

I. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

J. Do not use graphite pencils to mark metal surfaces.

2.07 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Fabricated Gutters:
   1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required and indicated.
   2. Materials;
      a. Pre-finished ANSI/ASTM A653 Galvanized sheet steel, minimum 0.034 inch (22 gauge).
   3. Size: As indicated on Drawings.
   4. SMACNA Style: As indicated on Drawings.
   5. Finish:
      a. Exterior Finish: Polyvinylidene fluoride (PVDF) minimum 70% Kynar resin, dry film thickness 0.8 mils minimum.
      b. Exterior primer: Baked on epoxy primer coat, dry film thickness 0.2 mils minimum.
      c. Color: Custom color to match Architects' sample.
      d. Interior finish: Factory standard prime-coat, dry film thickness 0.5 mils minimum.
   6. Expansion Joints: Built in.
   7. Accessories:
      a. Wire ball downspout strainer.
      b. Anchorage Devices: Type as recommended by manufacturer.
      c. Expansion Joints: Provide manufacturer's standard expansion joint assemblies allowing for minimum 3/4 inch thermal movement. Spacing per manufacturer.
      d. Gutter Brackets: Fabricate from 0.14 inch (10 gauge) steel, galvanize and finish to match color of gutter. Multiple shapes required.
      e. Top Gutter brackets: Fabricate 2 inch wide, from 0.060 inch (16 gauge) steel, galvanize and finish to match color of gutter. Space at no greater than 18 inches o.c.

B. Downspouts: Fabricate sheet metal downspouts complete with elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Fabricated Hanger Style: SMACNA figure designation Fig.1-35E- Round; 4-inch diameter.
   2. Fabricate from the following materials:
      a. Galvanized Steel: 24 gauge 0.028 inch thick.

C. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or

tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:

1. SMACNA: Fig. 1-27A or as indicated on Drawings.
2. Stainless Steel: 0.0188 inch thick.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim. Fabricate from the following materials:

1. SMACNA Type: Fig 1-25C.
2. Stainless Steel: 0.0156 inch thick.

E. Splash Pans:

1. SMACNA Type: Fig 1-36.
2. Fabricate from the following materials:
    a. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch thick.
    b. 20-gauge galvanized steel.

F. Color: Colors: As selected by Architect from manufacturer's full range, for roof drainage fabrications exposed to view.

2.08 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop): Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates. Shop fabricate interior and exterior corners.

B. Copings: Fabricate in minimum 96-inch long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.

1. Coping Profile: SMACNA figure designation 3-4A.
2. Joint Style: Butt, with 6-inch wide, concealed backup plate and 4-inch wide, exposed cover plates.
3. Fabricate from the following materials:
    a. Galvanized Steel: 22 gauge galvanized steel.
    b. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.

C. Roof to Wall Transition Expansion-Joint Cover: Fabricate from the following materials:

1. Galvanized Steel: 0.034 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch thick.

D. Roof Edge Flashing and Fascia Cover: Fabricate from the following materials:

1. Galvanized Steel: 0.034 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch thick.

E. Roof Edge and Heat Welded Flashing: Fabricate from Materials provided by other Division 07 Section “Polyvinyl-Chloride (PVC) Roofing” where flashing is heat welded to membrane.

1. Material: Polymer coated metal provided in gauge and color: see sections listed above.

F. Base Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

G. Counterflashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.022 thick.

H. Stainless Steel Roof Crickets: Soldered fabrication
   1. Stainless Steel: 0.0312 thick

I. Flashing Receivers: Fabricate from the following materials:
   1. Galvanized Steel: 0.022 inch thick.
   2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

J. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.
   2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

K. Roof-Drain Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.0312 thick.

2.09 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch high, end dams where flashing is discontinuous. Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch thick.
   2. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 6-inches beyond wall openings. Form head and sill flashing with 2-inch high, end dams. Fabricate from the following materials:
   1. Zinc Galvanized Steel: 0.022 inch thick.
   2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

C. Wall Expansion-Joint Cover: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.
   2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

D. Saddle Flashing: Fabricate with profile shown on drawings.
   1. Joint Style: Seamed and soldered.
   2. Sheet Metal: Stainless steel, 0.029-inch thick.

2.10 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.
   2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

B. Overhead-Piping Safety Pans: Fabricate from the following materials: Soldered fabrication
   1. Zinc-Tin Alloy-Coated Stainless Steel: 0.024 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.03 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel and aluminum sheet.
2. Pre-tinning is not required for zinc-tin alloy-coated stainless steel.
3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

4. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

G. Rivets: Rivet joints in matching colored metal where indicated and where necessary for strength.

3.04 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
2. Provide wire ball strainer at each downspout location.
3. Provide elbows at base of downspout to direct water away from building.
4. Connect downspouts to underground drainage system indicated.

C. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant compatible with roofing membrane.

D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Anchor scupper closure trim flange to exterior wall and solder] or seal with elastomeric sealant to scupper.
2. Loosely lock front edge of scupper with conductor head.
3. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

E. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper or gutter discharge.

F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.05 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at16-inch centers.
   1. Coordinate flashing required to be fabricated of coated metal used to heat weld flashing to PVC membrane. Coordinate with Division 07 Sections.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.
   1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
   2. Anchor interior leg of coping with neoprene washers and screw fasteners through slotted holes at 24-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.06 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "Unit Masonry."

C. Reglets: Installation of reglets is specified in Division 03 Section "Cast-in-Place Concrete" and Division 04 Section "Unit Masonry."

D. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

E. Rubberized flexible flashing at Louvers: Install rubberized flexible flashings in louver opening and into plenum sheet metal of mechanical duct. Install inside duct floor of plenum (3'-0" back and 3" up sides) and up sides to provide drainage plane for wind-driven rain to drain back out of sheet metal enclosure.

3.07 MISCELLANEOUS FLASHING INSTALLATION

A. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.08 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.09 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured units for the following applications:

1. Copings.
2. Underlayment.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing embedded reglets.
2. Section 055000 "Metal Fabrications" for downspout guards and downspout boots.
3. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
4. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated, sheet metal flashing and trim.
5. Section 077129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint cover assemblies.
6. Section 077200 "Roof Accessories" for manufactured roof curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
7. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.
8. Section 099113 "Exterior Painting" for field painting of roof specialties.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof specialty.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Plans, expansion-joint locations, keyed details, and attachments to other work. Distinguish between factory pre manufactured- and field-assembled installation.
2. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Details of termination points and assemblies, including fixed points.
5. Details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

1. Include copings, reglets and counterflashings made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of roof specialty copings that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.

B. Product Test Reports: For copings, for tests performed by a qualified testing agency.

C. Research Reports: For copings, from an agency acceptable to authorities having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

D. Qualification Statements: For manufacturer.

E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roof specialties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products that are FM Approvals listed for specified class and ANSI/SPRI/FM 4435/ES-1 tested to specified design pressure.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate roof specialties with roofing system, exterior wall system, air barrier, flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, weathertight, secure, and noncorrosive installation.

1. Performance Coordination: Coordinate with the Work of roofing and exterior wall Sections to ensure that roof specialties provided under the Work of this Section meet or exceed specified roofing and exterior wall design performance requirements.

B. Confirm and coordinate compatibility of materials and comply with warranty requirements of roofing system manufacturer.

C. Coordinate roof specialties layout and seams with sizes and locations of joints and seams in adjacent materials.

1.10 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 017800 "Contract Closeout."

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finishes or replace roof specialties that show evidence of deterioration of factory-applied finishes within

specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. FM Approvals' Listing: Manufacture and install copings that are listed in FM Approvals' "Approval Guide" and approved for windstorm classification, Class 1-120. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install copings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 ft., concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Manufacturers: Subject to compliance with requirements, provide products by

the following:

a. ATAS International, Inc.
b. PAC-CLAD; Petersen; a Carlisle company

2. Metallic-Coated Steel Coping Caps: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, nominal 0.034-inch thickness.

a. Surface: Smooth, flat finish.
b. Finish: Three-coat fluoropolymer.
c. Color: Match Existing Adjacent as offered by Manufacturer

3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Coping-Cap Attachment Method: face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.

a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
b. Face-Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.3 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. ATAS International, Inc.
2. Fry Reglet

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:

1. Metallic-Coated Steel Sheet: Nominal 0.028-inch thickness.
2. Corners: Factory mitered and mechanically clinched and sealed watertight.
3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Stucco Type, Embedded: Provide reglets with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
5. Concrete Type, Embedded: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
6. Multiuse Type, Embedded: For multiuse embedment in cast-in-place concrete.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 ft. designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:

1. Metallic-Coated Steel Sheet: Nominal 0.028-inch thickness.

D. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Finishes:

1. Metallic-Coated Steel: Three-coat fluoropolymer

a. Color: Match Existing

2.4 SHEET METAL MATERIALS

A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 coating designation; structural quality. Mill phosphatized for field painting where indicated.

1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.

B. Aluminum Sheet: ASTM B209/B209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

C. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise, mill finished.

D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.

E. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

2.5 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Roof specialty manufacturer's recommended fasteners, designed to meet performance requirements, suitable for application and metals being fastened. Match

finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Metallic-Coated Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
4. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
5. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

G. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer's written installation instructions.

1. Coat concealed side of uncoated aluminum and stainless steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 ft. with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended in writing by fastener manufacturer to achieve maximum pull-out resistance

E. Seal concealed joints with butyl sealant as required by roof specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 INSTALLATION OF COPINGS

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at [manufacturer's required spacing that meets performance requirements.
2. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.4 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

A. Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See Section 033000 "Cast-in-Place Concrete" for installation of reglets.

C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.

D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.5 CLEANING AND PROTECTION

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Section 099113 "Exterior Painting."

C. Clean and neutralize flux materials. Clean off excess solder and sealants.

D. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

E. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 07 71 29 - MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flanged bellows-type roof expansion joints.
2. Extruded bellows roof expansion joints.
3. Aluminum roof expansion joints.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wooden curbs or cants for mounting roof expansion joints.
2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.
3. Section 077200 "Roof Accessories" for manufactured and prefabricated metal roof curbs.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Flanged bellows-type roof expansion joints.
2. Extruded bellows roof expansion joints.
3. Aluminum roof expansion joints.
4. Preformed foam sealant-type roof expansion joints.

B. Shop Drawings: For roof expansion joints.

1. Include plans, elevations, sections, and attachment details.
2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
3. Provide isometric drawings of intersections, terminations, changes in joint direction or planes, and transition to other expansion joint systems depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.

C. Samples: For each exposed product and for each color specified, 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer of roofing membrane.

1.6 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof expansion joints that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other

detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 FLANGED BELLOWS-TYPE ROOF EXPANSION JOINTS

A. Flanged Bellows-Type Roof Expansion Joint: Factory-fabricated, continuous, waterproof, joint cover consisting of exposed membrane bellows laminated to flexible, closed-cell support foam, and secured along each edge to 3- to 4-inch- wide metal flange.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Construction Specialties, Inc.

2. Source Limitations: Obtain flanged bellows-type roof expansion joints approved by roofing manufacturer and that are part of roofing membrane warranty.
3. Joint Movement Capability: Plus and minus 25 percent of joint size.
4. Bellows: EPDM flexible membrane, nominal 60 mils thick.
5. Flanges: Galvanized steel, 0.022 inch thick.
6. Configuration: Angle formed to fit curbs as indicated on Drawings.
7. Corner, Intersection, and Transition Units: Provide factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints.
8. Cover Membrane: EPDM flexible membrane, factory laminated to bellows and covering entire joint assembly and curbs.

    a. Color: Black.

9. Accessories: Provide splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation.
10. Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary bellows assembly.

    a. Drain-Tube Assemblies: Equip secondary seal with drain tubes and seals to direct collected moisture to exterior-wall expansion joint cover.
    b. Thermal Insulation: Fill space above secondary seal with mineral-fiber blanket insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84.

11. Fire Barrier: Manufacturer's standard fire barrier for fire-resistance-rated expansion joint system.

B. Materials:

1. Galvanized-Steel Sheet: ASTM A653/A653M, hot-dip zinc-coating designation G90.
2. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

3. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
4. Aluminum Sheet: ASTM B209, mill finish, with temper to suit forming operations and performance required.

    a. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.

5. EPDM Membrane: ASTM D4637/D4637M, type standard with manufacturer for application.
6. Neoprene Membrane: Neoprene sheet recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil; and as standard with roof-expansion-joint manufacturer for application.
7. PVC Membrane: ASTM D4434/D4434M, type standard with manufacturer for application.

2.3 EXTRUDED BELLOWS ROOF EXPANSION JOINTS

A. Materials:

1. Aluminum: ASTM B221 for extrusions; mill finish, with temper to suit forming operations and performance required.

    a. Apply manufacturer's standard protective coating on aluminum surfaces in contact with cementitious or preservative-treated wood materials.

2. Silicone Extrusions: ASTM D2000, UV stabilized, and that does not propagate flame.
3. EPDM Membrane: ASTM D4637, type standard with manufacturer for application.

2.4 ALUMINUM ROOF EXPANSION JOINTS

A. Materials:

1. Aluminum: ASTM B209 for sheet and plate, ASTM B221 for extrusions; alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

    a. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.
    b. Mill Finish: As manufactured.

2.5 MISCELLANEOUS MATERIALS

A. Adhesives: As recommended by roof-expansion-joint manufacturer.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.

1. Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.

C. Mineral-Fiber Blanket: ASTM C665.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joint openings, substrates, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions for handling and installing roof expansion joints.

1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
2. Install roof expansion joints true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
3. Provide for linear thermal expansion of roof-expansion-joint materials.
4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
5. Provide uniform, neat seams.
6. Install roof expansion joints to fit substrates and to result in watertight performance.

B. Directional Changes: Install factory-fabricated units at directional changes to provide continuous, uninterrupted, and watertight joints.

C. Transitions to Other Expansion-Control Joint Assemblies: Coordinate installation of roof expansion joints with other exterior expansion-control joint assemblies specified in Section 079513.16 "Exterior Expansion Joint Cover Assemblies" to result in watertight performance. Install factory-fabricated units at transitions between roof expansion joints and exterior expansion-control joint systems.

D. Splices: Splice roof expansion joints to provide continuous, uninterrupted, and waterproof joints.

1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.

E. Fire Barrier: Install fire barrier as required by manufacturer to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.

F. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

END OF SECTION

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes:
   1. Roof curbs.
   2. Equipment supports.
   3. Roof hatches.
   4. Roof vents
   5. Preformed flashings.

B. Related Sections:
   1. Division 05 Section "Metal Fabrications" for metal vertical ladders and access to roof hatches.
   2. Division 05 Section "Pipe and Tube Railings" for safety railing system not attached to roof hatch curbs.
   3. Division 06 Section "Rough Carpentry" for roof sheathing, wood cants, and wood nailers.
   5. Division 07 Section "Sheet Metal Flashing and Trim" for shop and field-fabricated metal flashing and counterflashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.03 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of optional equipment (solar panels) to be supported.

1.04 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
   1. Size and location of roof accessories specified in this Section.
   2. Method of attaching roof accessories to roof or building structure.
   3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

D. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

E. Delegated-Design Submittal: For curbs and equipment supports (optional solar panels) indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
   2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

F. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

B. Pre-installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.08 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing materials and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
   1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes and roof expansion joints.

1.09 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design roof curbs and equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind-Restraint Performance: As indicated on Drawings.

2.02 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated and mill phosphatized for field painting.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.

C. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.
   2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coated.
   3. Exposed Finishes: High-Performance Organic Finish (2-Coat Fluoropolymer): Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
      a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements in AAMA 2605, except as modified below:
         1) Humidity Resistance: 2000 hours.
         2) Salt-Spray Resistance: 2000 hours.

D. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and mill finish. Coil-coat finish as follows:
   1. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Conversion coating; Organic Coating: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturer's written instructions.
      a. Color and Gloss: As selected by Architect from manufacturer's full range.
   2. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.
      a. Color and Gloss: As selected by Architect from manufacturer's full range.

E. Aluminum Extrusions and Tubes: ASTM B 221, alloy and temper recommended by manufacturer for type of use, mill finished.

F. Stainless-Steel Shapes or Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316, No. 2D finish.

G. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.

H. Steel Tube: ASTM A 500, round tube, baked-enamel finished.

I. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123/A 123M.

J. Galvanized Steel Pipe: ASTM A 53/A 53M.

2.03 MISCELLANEOUS MATERIALS

A. Polyisocyanurate Board Insulation: ASTM C 1289, 1 inch thick.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

D. Polyethylene Sheet: 6-mil- thick, polyethylene sheet complying with ASTM D 4397.

E. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
   1. Slip Sheet: Rosin-sized paper, minimum 6 lb/100 sq. ft..

F. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of

exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, and heavy bodied for hooked-type expansion joints with limited movement.

J. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.04 ROOF CURBS

A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
   1. Available Manufacturers:
      a. Curbs Plus Inc.
      b. Custom Curb, Inc.
      c. LM Curbs.
      d. Pate Company (The).
      e. Roof Products & Systems Corporation.
      f. Roof Products, Inc.
      g. Thaler Metal Industries Ltd.
      h. Vent Products Company, Inc.
      i. Or approved.
   2. Load Requirements: See structural drawings and general notes.
   3. Material: Aluminum-zinc alloy-coated steel sheet, 0.052 inch (1.32 mm) thick.
   4. Material: Stainless-steel sheet, 0.078 inch (1.98 mm) thick.
      a. Finish: High-performance organic coating.
   5. Liner: Same material as curb, of manufacturer's standard thickness and finish.
   6. Factory install wood nailers at tops of curbs.
   7. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
   8. Factory insulate curbs with 1-1/2-inch thick minimum, glass-fiber board insulation.
   9. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.

10. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.05 EQUIPMENT SUPPORTS

A. Equipment Supports: Metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded framework and integrally formed structure-mounting flange at bottom.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.

D. Material: Manufacturer's standard.
1. Finish: Two-coat fluoropolymer or anodized.
2. Color: As selected by Architect from manufacturer's full range.

E. Construction: Manufacturer's standard, or as indicated on Drawings, with supports compatible with roofing system.

2.06 ROOF HATCHES

A. Roof Hatches: Thermally broken metal roof-hatch units with insulated lid and single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Babcock-Davis; ThermalMAX Roof Hatch BRHTA36X30S1T, or BILCO Company; Thermally Broken Roof Hatch Type GS-50TB, or comparable products by one of the following:
a. Activar Construction Products Group, Inc. - JL Industries.
b. Custom Solution Roof and Metal Products.
c. Dur-Red Products.
d. Milcor; a division of Hart & Cooley, Inc.
e. Nystrom.
f. O'Keeffe's Inc.
g. Precision Ladders, LLC.

B. Size and Type: 36-inch length by 36-inch wide. Length denotes hinge side. The roof hatch shall be single leaf.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Aluminum sheet.
1. Thickness: 11 gauge; manufacturer's standard.
2. Finish: Mill.

3. Color: Factory finish shall be mill finish aluminum.

E. Construction:
1. Curb and Cover Insulation: 3-inch-thick, polyisocyanurate board.
a. R-Value: 20, minimum, according to ASTM C1363.
2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
6. Curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
7. Hardware: Spring operators, hold-open arm, stainless steel spring latch with turn handles, stainless steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

F. Ladder Safety Post: Manufacturer's standard device for attachment to roof-access ladder. Post to lock in place on full extension. Provide release mechanism to return post to closed position.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Babcock-Davis; Ladder Safety Post model BSPY or a comparable product by one of the approved manufacturers.
2. Test Load: 200lbs minimum.
3. Height: 42 inches above finished roof deck.
4. Material and Finish: Steel, powder coat paint, safety yellow finish.
5. Post Dimension:1-1/2 inch x 1-1/2 inch x 1/8 inch, manufacturer's standard.
6. Hardware: Type 316 Stainless Steel.

2.07 PREFORMED FLASHINGS

A. Exhaust Vent Flashings: Double-wall metal flashing sleeve, urethane insulation filled, with integral deck flange, 12 inches high, with removable metal hood and metal collar, and as follows:
1. Available Manufacturers:
a. Thaler Metal Industries Ltd.
2. Metal: Aluminum sheet, 0.064 inch thick, mill finished.
3. Diameter: As indicated.

B. Vent Stack Flashing: Metal flashing sleeve, with integral deck flange, uninsulated, and as follows:
1. Available Manufacturers:
a. Thaler Metal Industries Ltd.
2. Metal: Aluminum sheet, 0.064 inch thick, mill finished.
3. Height: 13 inches.
4. Diameter: As indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
   1. Verify that substrate is sound, dry, smooth, and clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
   2. Verify dimensions of roof openings for roof accessories.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum or stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
   3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Roof Curb Installation:
   1. Set roof curb so top surface of roof curb is level.

F. Equipment Support Installation:
   1. Set equipment support so top surface of equipment support is level.

G. Roof Hatch Installation:
   1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
   2. Attach safety railing system to roof hatch curb.
   3. Attach ladder safety post according to manufacturer's written instructions.

H. Gravity Ventilator Installation:

1. Check relief vents for proper operation and unrestricted airflow.
2. Install security grilles. Weld bar intersections and ends of bars to structural frame or primary curb walls.

I. Preformed Flashing Installation:
1. Secure to roof membrane according to vent and stack flashing manufacturer's written instructions.

J. Seal joints with elastomeric or butyl sealant as required by manufacturer of roof accessories.

3.03 TOUCH UP

A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 09 painting Sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.04 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.

B. Related Sections:
   1. Division 09 Section “Gypsum Board” for labeling requirements of walls containing firestopping systems.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 SUBMITTALS

A. Product Data: For each type of product.

B. Through-Penetration Firestopping System Schedule: Indicate locations of each through-penetration firestopping system, along with the following information:
   1. Types of penetrating items.
   2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
   3. Through-penetration firestopping systems for each location identified by firestopping design designation of qualified testing and inspecting agency.

C. Engineering Judgments for Deviations from Typical Conditions: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
   1. Obtain approval of authorities having jurisdiction prior to submittal.

D. Qualification Data: For Installer.

E. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

F. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:
   1. A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
   2. A firm specializing in performing the work of this section, with minimum five years of experience.

B. Mockups: Build mockups to verify selections made under submittals above and to set quality standards for installation.
   1. Install firestopping in mockups of assemblies specified in other Sections that are indicated to receive firestopping specified in this Section. Use materials and installation methods specified in this Section.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestopping system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestopping systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.08 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

C. Do not cover up through-penetration firestopping system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Penetration firestopping systems shall comply with the following requirements:
   1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
      a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
         1) UL in its "Fire Resistance Directory."
         2) Intertek Group in its "Directory of Listed Building Products."
         3) FM Global in its "Building Materials Approval Guide."

2.02 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestopping systems, under conditions of service and application, as demonstrated by through-penetration firestopping system manufacturer based on testing and field experience.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. 3M Fire Protection Products.
   2. A/D Fire Protection Systems Inc.
   3. Hilti, Inc.
   4. NUCO Inc.
   5. Passive Fire Protection Partners.
   6. Specified Technologies, Inc.
   7. Tremco, Inc.

C. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

D. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
   1. Sealant shall have a VOC content of 250 g/L or less.

F. For through-penetration firestopping 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 piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestopping systems.
   2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestopping systems capable of supporting floor loads involved, either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide through-penetration firestopping systems not requiring removal of insulation.

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
   1. Permanent forming/damming/backing materials.
   2. Substrate primers.
   3. Collars.
   4. Steel sleeves.

2.03 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.04 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.03 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

A. Wall Identification: Refer to Division 09 Section “Gypsum Board.”

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.05 FIELD QUALITY CONTROL

A. Perform visual inspection for completeness of Work. Where deficiencies are found or penetration firestopping system is damaged or removed, repair or replace penetration firestopping system to comply with requirements.

B. Proceed with enclosing penetration firestopping systems with other construction only after visual inspection to confirm installations comply with requirements.

3.06 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Standard and custom hollow metal doors and frames.
   2. Steel sidelite, borrowed lite, and transom frames.
   3. Factory finishing hollow metal doors and frames and factory machining for hardware.
   4. Lite frames and glazing installed in hollow metal doors.

B. Related Sections:
   1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
   2. Division 07 Section "Thermal Insulation" for spray-in-foam or mineral-fiber insulation in hollow metal frames.
   3. Division 08 Section "Aluminum Entrances and Storefronts" for installation of framework into which hollow metal door and frame assemblies are installed.
   4. Division 08 Sections “Flush Wood Doors" or wood doors in hollow metal frames.
   5. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
   6. Division 08 Section "Glazing" for door and hollow metal framed glazing.
   7. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
   8. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.03 REFERENCES

A. ANSI (American National Standards Institute):
   1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
   3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

6. ANSI/SDI A250.13 - Testing and Rating of Sever Windstorm Resistant Components for Swing Door Assemblies.
7. ANSI/NAMM/HMMA 867-06 - Guide Specifications for Commercial Laminated Core Hollow Metal Doors and Frames.
8. ANSI/BHMA A156.15 - Hardware Preparation in Steel Doors and Frames.
9. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
10. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
11. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.

B. ASTM (American Society for Testing and Materials):
1. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
5. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
6. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Doors Under Specified Pressure Differences Across the Specimens.
7. ASTM E 413 - Classification for Rating Sound Insulation.
8. ASTM E1332 - Standard Classification for Determination of Outdoor-Indoor Transmission Class.

C. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.

D. UL 10C (1998) - Positive Pressure Fire Tests of Door Assemblies; UL 1784 (2001) - Standard for Air Leakage Tests of Door Assemblies.

1.04 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating,, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:
1. Elevations of each door design.

2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Detail Door and Frame anchorage to Aluminum storefront framing.
5. Locations of reinforcement and preparations for hardware.
6. Details of each different wall opening condition.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.
10. Details of conduit and preparations for power, signal, and control systems.

C. Other Action Submittals:
1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

E. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly and thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL 10C.
1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
2. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.
a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.
1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM C1363 and meet or exceed the following requirements:
a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.35, R-Value 2.9, including insulated door, thermal-break frame and threshold.

2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM E283 to meet or exceed the following requirements:
   a. Rate of leakage of the door assembly shall not exceed 0.30 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).

E. Sound Transmission Class (STC) Rated Doors: Provide sound transmission class rated doors fabricated as sound-reducing types with testing according to ASTM E 90, and classifications according to ASTM E 413. Submit manufacturer's written results of STC ratings from testing performed by a qualified independent testing agency for sound resistant doors.

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
   1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.09 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
   1. Coordinate and provide anchorage to Aluminum Storefront framing.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Apex Industries, Inc.
   2. Ceco Door; AADG, Inc.; ASSA ABLOY.
   3. Curries, AADG, Inc.; ASSA ABLOY Group.
   4. Republic Doors and Frames; a Allegion brand.
   5. Steelcraft; Allegion plc.
   6. Stiles Custom Metal, Inc.

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Zcoating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M. Cement grout for all steel frames (door and relite) in concrete and masonry walls (see Division 04 Section "Unit Masonry"). Do not grout mullions or frames that are fully enclosed.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
   1. Provide insulated door assembly with a minimum of .36 U.

I. Glazing: Comply with requirements in Division 08 Section "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities. Do not apply to fire-rated frames.

K. Dissimilar Metals: provide isolation protection of dissimilar metals.

2.03 STANDARD HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Type: As indicated in the Door Schedule.
   2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral core, or vertical steel-stiffener core.
      a. Polystyrene and Polyurethane (Insulated) Doors: Where indicated, provide doors fabricated as thermal-rated assemblies.
         1) Thermal-rated assemblies shall have a minimum R-value 11 or better.
      b. Standard Vertical Steel-Stiffener Core: Minimum 22 gauge steel-stiffeners at 6 inches on-center construction attached by spot welds spaced not more than 5" on centers. Spaces between stiffeners filled with fiberglass insulation (minimum density 0.8#/cubic ft.).
   3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.0598-inch) thick steel, Model 2 (Fully welded, seamless face and edges).
   4. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
   5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
   6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
   7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

8. Basis of Design:
    a. CECO Door Products (C) - Steel-Stiffener: Medallion Series.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
    1. Design: Flush panel.
    2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
        a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    3. Level/Model: Level 3 and Physical Performance Level B (Heavy Duty), Minimum 0.042-inch thick steel, Model 2 (Fully welded, seamless face and edges).
    4. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Edge, 1/8 inch in 2 inches.
    5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
    6. Hinge Reinforcement: Minimum 3/16 inch plate, 1-1/4 by 9 inches or minimum 0.067 continuous channel with pierced holes, drilled and tapped.
    7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
    8. Basis of Design:
        a. CECO Door Products (C) - Temperature Rise: Medallion 450 Series.

2.04 ENERGY EFFICIENT HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design specified, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
    1. Design: Flush panel.
    2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.
        a. Provide 0.0299 inch thick steel stiffeners at 6 inches on-center internally welded at 5 inches on center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
        b. Thermal properties to rate at a minimum R Factor of 11.01, per ASTM C518.

3. Level/Model: Level 2 and Physical Performance Level A (Extra Heavy Duty), Minimum 0.042 inch thick steel, Model 2 (Fully welded, seamless face and edges).
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Edge, 1/8 inch in 2 inches.
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 3/16 inch thick plate, 1-1/4 by 9 inches.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
8. Basis of Design:
    a. CECO Door Products (C) - Trio-E Series.

2.05 SOUND RESISTANT DOORS

A. Subject to the same compliance standards and requirements as standard hollow metal doors, provide manufacturer's standard sound resistant acoustic core tested in accordance with ASTM E 90, ASTM E 413, and ASTM E 1332 standards. Fabricate with minimum 16 gauge construction, 1-3/4 inch thickness, combined with standard flush frames designed for mid-range and high range sound attenuation for STC 52 applications. Furnish complete with perimeter sound seals, bottom seals, and threshold as required for STC 52 rating.
    1. Basis of Design:
        a. CECO Door Products (C) - Sound-Tech Series or comparable product from Overly Door Company.

2.06 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Masonry Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
    1. Fabricate frames with mitered or coped corners.
    2. Fabricate frames, with the exception of knock down types, with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
    3. Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 0.067-inch thick steel sheet.
    4. Basis of Design:
        a. CECO Door Products (C) - SQ/SU and SR Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
    1. Fabricate frames with mitered or coped corners.

2. Fabricate frames, with the exception of slip-on drywall types, with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
3. Frames for Level 2 Steel Doors: Minimum 0.053-inch thick steel sheet.
4. Frames for Wood Doors: Minimum 0.053-inch thick steel sheet.
5. Frames for Borrowed Lites: Minimum 0.053-inch thick steel sheet.
6. Basis of Design:
   a. Masonry: CECO Door Products (C) - SQ/SU and SR Series.
   b. Drywall: CECO Door Products (C) - DU/DQ, DC, and DC Series.
7. Fire Rated Frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
8. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.07 ENERGY EFFICIENT HOLLOW METAL FRAMES

A. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate from minimum 16 gauge galvannealed steel, with positive 3/8" vinyl thermal break and integral vinyl weatherstripping. Thermal break frames available as knock down types only.
   1. Basis of Design:
      a. Steelcraft; FT Series Thermal Break Hollow Metal Frames or comparable.

B. Weather-stripped Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated weather-stripped profiles with 1/8" integral kerf formed into the frame soffit able to receive manufacturer's listed gasket material. Available for use in both masonry and drywall construction, with fire rating up to 3 hours complying with NFPA 105, UL 1784, and ASTM E-283 Test criteria.
   1. Basis of Design:
      a. CECO Door; Weather-stripped SQW and SRW Series or comparable.

2.08 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
   3. Post installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.09 LITE OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricators shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 18 gauge (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames

D. Preformed Metal Frames for Lite Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

E. Glazing: Comply with requirements in Division 08 Section "Glazing" and with the hollow metal door manufacturer's written instructions.
1. Factory Glazing: Doors with factory installed glass to include all of the required glazing material.

2.10 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.11 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861 (Custom).

C. Hollow Metal Doors:
1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware."
5. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware". Wire nut connections are not acceptable.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Aluminum Storefront and Curtain Wall Frame Anchors: welded frame pipe anchors at Countersunk fastener locations.
3. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops require wider dimensions on glass side of frame.
5. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
6. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
7. Provide countersunk, flat Phillips head exposed screws and bolts for exposed fasteners unless otherwise indicated.
8. Mortar Guards: Weld guard boxes to frame at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
9. Electrical Thru-Wiring: Provide hollow metal frames receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on one end to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electric through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware."
10. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
    a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
    b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.

c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

11. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
12. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
    c. Post installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
13. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated on final Shop Drawings, or if not indicated, according to ANSI/NAAMM-HMMA 861.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
   4. Provide loose stops and moldings on inside of hollow metal work.
   5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.12 STEEL FINISHES

A. Preparation: Clean, treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.

B. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
   2. Primer for Fire Rated Doors: Tnemec Polyamide epoxy- Series 66 at 4 mils DFT at all fire-rated interior frame surfaces. Provide primer in different color then primer specified above. Do not apply asphaltic emulsion on fire rated doors.
   3. Apply asphaltic emulsion only on door frames to receive grout fill in masonry walls.

2.13 PAINT COLOR AND GLOSS:

A. Refer to Division 09 Sections "Exterior Painting" and "Interior Painting."
   1. Color: As indicated in Finish Schedule on Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive contemplated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with HMMA 840.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-protection-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable glazing stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g. Field apply bituminous coating to backs of frames that are filled with grout. Apply approximately 1/8 inch thick over shop primer and allow to thoroughly dry before handling or installation. Do not apply to fire-rated doors assemblies, use primer product specified in Part 2 “Steel Finishes” subparagraph above in lieu of asphaltic emulsion.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post installed expansion anchors.
    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Solidly pack mineral-fiber insulation inside frames.
4. Grouted Frames: Verify prior to proceeding with grouting if frames have not been treated with asphaltic emulsion in accordance with “Field apply bituminous…” subparagraph above under “Hollow Metal Frames” paragraph or at fire-rated door frames treatment with fire-rated epoxy primer.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
6. In-Place Concrete or Masonry Construction: Secure frames in place with post installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with post installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    a. Squareness: Plus or minus 1/32 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/32 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/32 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/32 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 1/4 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 1/2 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Access Doors.

B. Related Sections:
   1. Division 07 Section "Roof Accessories" for roof hatches.
   2. Division 23 for heating and air-conditioning duct access doors.

1.03 SCOPE OF WORK

A. Provide access doors in walls and ceilings wherever items requiring maintenance or code mandated access are installed concealed in the construction, such as for electrical junction boxes, fire/smoke dampers, plumbing shut-off valves, fire sprinkler drain valves, equipment, concealed mechanisms, door adjustment, and similar conditions.
   1. Exact locations and sizes of access doors are not always indicated on the Drawings. Obtain specific locations and sizes for access doors from trades requiring access to concealed equipment.
   2. Access doors shall be sized to allow easy maintenance access by average size person and shall be large enough to allow maintenance and replacement functions to occur.
   3. Where access doors must be used in fire-rated assemblies, provide fire - rated access doors matching fire rating of assembly in which it is installed.

1.04 REFERENCES

A. All references shall be the latest adopted edition.

B. Building Materials Directory; Underwriters Laboratories Inc. (UL)

C. UL 10B -- Standard for Fire Tests of Door Assemblies; Underwriters Laboratories Inc.

1.05 SUBMITTALS

A. Refer to Division 01 Section "Submittal Procedures."

B. Product Data: Provide general construction, component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
   1. Show mounting and installation requirements for fire rated installation.

1.06 QUALITY ASSURANCE

A. Fire Resistance:
   1. Provide access door units which have been tested in accordance with UL 10B, and are listed in Underwriters Laboratory, Inc. "Building Materials Directory" for fire rating indicated.
      a. Attach UL label to each fire-rated access door.
   2. For fire-rated ceiling access doors, provide door assembly from manufacturer whose products have been tested by independent testing agency and have been found acceptable for fire ratings indicated.
      a. Provide testing agency label on each fire-rated access door.

1.07 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of access doors with other work to avoid delays.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The following manufacturers, provided they comply with requirements of this section, are acceptable:
   1. J. L. Industries.
   2. Karp Associates.
   3. Larsens Manufacturing Company
   4. Milcor / Lima Register.
   5. Williams Brother Corp.

2.02 MANUFACTURED UNITS

A. Access Door Assembly at Non-Rated Locations:
   1. Location: Wall or Ceiling.
   2. Type: Flush door panel with concealed drywall frame.
   3. Fire rating: Non-rated.
   4. Frame: 16 gage steel.
      a. Provide Type 304 stainless steel at Toilet Rooms (except ceiling) and wet areas.
   5. Door: 14 gage steel flush panel.
      a. Provide Type 304 stainless steel at Toilet Rooms (except ceiling) and wet areas.
   6. Hinge: Continuous type hinge with stainless steel pin.
   7. Finish: Baked-on rust-inhibitive prime coat. Ready for paint per Division 09 Section "Interior Painting."
      a. Stainless Steel: #4 brushed satin finish.

8. Size: As required for access, or as shown.

B. Access Door Assembly at Fire Rated Assemblies:
1. Location: Wall or Ceiling.
2. Type: Flush door panel with concealed drywall frame.
3. Substrate: Frame wall/shaft wall.
4. Fire rating: Match fire rating of assembly that access door is mounted in.
5. Frame: 16 gage steel.
   a. Provide Type 304 stainless steel at Toilet Rooms (Except Ceiling) and wet areas.
6. Door: 20 gage steel flush panel, welded hollow metal construction.
   a. Provide Type 304 stainless steel at Toilet Rooms (except ceiling) and wet areas.
7. Hinge: Continuous type hinge with stainless steel pin.
8. Finish: Baked-on rust-inhibitive prime coat.
   a. Stainless Steel: #4 brushed satin finish.
9. Size: As required for access, or as shown.

2.03 ACCESSORIES

A. Locking Devices:
1. Access Doors in Occupied Areas and Rooms: Provide lock assembly that will accommodate keyed cylinder provided by Division 08 Section "Door Hardware."
2. Access Doors in Concealed Locations Above Ceiling or secure Mechanical and Storage Rooms: Provide latch opened with a flat blade screwdriver.

2.04 FABRICATION

A. Access Doors and Frames:
1. General: Fabricate access door components of continuous welded construction, with welds ground smooth.
   a. Fabricate units of continuous welded steel construction.
2. Frames:
   a. Concealed frames in gypsum board construction: Fabricate frame with perforated flanges and gypsum board finishing trim.
   b. CMU Construction: Exposed perimeter frame.
3. Doors: Flush panel doors
   a. Fabricate door panel from material and gage indicated, with a smooth face, and with door edges installed square with door frame.
   b. Fabricate fire-rated units with insulated flush doors, continuous piano hinge, and self-closing mechanism with interior side safety latch release in manufacturer's standard tested design for fire rating indicated.

B. Shop and Factory Finishing: Prime paint finish: Where indicated, finish door assembly with manufacturer's standard factory applied rust-inhibitive primer suitable for field painting by Division 09 Section "Interior Painting."
1. Stainless Steel Units: No. 4 brushed satin finish.

PART 3 - EXECUTION

3.01 COORDINATION

A. Review, coordinate and accommodate work of other trades that interface with, affect or are affected by the work of this section to facilitate the execution of the overall Work of this project in a coordinated and efficient manner.

B. Coordinate installation to occur prior to finish taping of GWB with Division 09 Section "Gypsum Board."

3.02 INSTALLATION

A. Install access doors in accordance with door manufacturer's installation instructions and fire rating requirements.

B. Fasten access door assemblies securely in place with exposed surfaces located level and flush with substrate.

3.03 ADJUSTING

A. Upon completion of installation, adjust door panels, hinges, and hardware to operate smoothly.

B. Remove and replace damaged or warped doors or frames.

3.04 FIELD QUALITY CONTROL

A. Contractor Quality Control: Assign quality control personnel to monitor the work of this section for conformance to the requirements of this section and to good construction practices.
   1. Contractor is solely responsible for managing and controlling the quality of the work and conformance with the requirements of this section.

END OF SECTION

SECTION 08 40 00 - ALUMINUM ENTRANCE & WINDOW SYSTEMS

1.1 CONTRACT CONDITIONS

A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith, in addition to this Specification and accompanying Drawings.

1.2 PRODUCTS INSTALLED, BUT FURNISHED UNDER OTHER SECTIONS

A. Door Hardware specified in Section 08-71-00.
B. Glazing specified in Section 08-80-00

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Joint Caulking & Sealing: Section 07-92-00
B. Hollow Steel Doors & Frames: Section 08-11-00
C. Wood Doors: Section 08-21-00

1.4 REFERENCED SPECIFICATIONS

A. Comply with applicable portions of manufacturing and installation recommendations of American Architectural Manufacturer's Association, hereinafter referred to as AAMA; 1827 Walden Office Square; Suite 550; Schaumburg, IL 60173; (847) 303-5664.
B. Copies can be obtained from Association.

1.5 SYSTEM DESIGN REQUIREMENTS

A. In accordance with governing laws, regulations, and codes; Drawings and Specifications, and Design-Build requirements specified in Section 01-11-50; design, engineer, fabricate, and install Work of this Section including System Supports & Attachments.

1.6 SHOP DRAWINGS

A. Submit in accordance with Section 01-33-00.
B. Show construction, materials, profiles, thicknesses, dimensions, fasteners, supports, anchors, required clearances, and other pertinent details.

1.7 SAMPLES

A. Submit in accordance with Section 01-33-00.
B. Include two 12 inch long Samples of specified Metal Finishes.
C. Match fabricated Work with accepted Samples.

1.8 PRODUCT DELIVERY

A. Coordinate with General Contractor's work schedule.

1.9 PRODUCT STORAGE & HANDLING

A. Protect against damage and discoloration.

1.10 FIELD MEASUREMENTS

A. Verify prior to fabrication.
B. If field measurements differ slightly from Drawing dimensions modify Work as required for accurate fit. If measurements differ substantially, notify Architect prior to fabrication.

1.11 SPECIAL WARRANTY

A. For 2 years following Substantial Completion date, and in accordance with Contract Conditions, warrant exterior installations against water-leakage and air-infiltration, and to repair or replace without additional cost to Owner any water leaks and resulting damage to Building Materials and/or Building Contents as may occur under normal usage within Warranty Period.
B. We, the Undersigned, do hereby warrant for 10 years following Project Substantial Completion, defective Work as specified above, but not including any damage to Building Materials or Building Contents.

1. SYSTEM SUBCONTRACTOR: _____
2. By: _____
3. GENERAL CONTRACTOR: _____
4. By: _____

PART 2 - PRODUCTS

2.1 ALUMINUM

A. Alloys & Tempers, unless otherwise modified, as follows:
    1. Exposed Extrusions: 6063-T6
B. Structural Shapes, Blocking, Bracing, & other Concealed Members: 6061-T6 or 6063-T6
    1. Casting: 214-T6
    2. Sheetmetal: 5005-H32

3. Special Finishes: Modify Alloys and Tempers specified above as necessary for proper application of any Special Finishes specified hereunder.
4. Perform any cutting, shaping, bending, or welding prior to finishing.

C. Finish:
1. Concealed Work: Mill finish
2. Exposed Work: Match Existing Bronze Anodized

2.2 STEEL REINFORCING

A. Manufacturing Standard: ASTM A-36

2.3 FASTENERS

A. Type: Recommended by Manufacturer for conditions of use
B. Material: Galvanically compatible with Adjacent Materials
C. Finish:
1. Where Exposed to View: Match Adjacent Material
2. Where Concealed: Contractor's choice

2.4 CORROSION INSULATING COMPOUND

A. Material: Asphaltic Coating Compound
B. Manufacturing Standard: Fed. Spec. TT-C-494 type II

2.5 DOOR FRAMES & WINDOW WALL FRAMES

A. Material: Aluminum
B. Manufacturer: Arcadia, Kawneer, US Aluminum, Vistawall, or approved.
C. Series: Match Kawneer 451-T, verify matching existing system.

2.6 SWINGING DOORS

A. Material: Aluminum
B. Manufacturer: Arcadia, Kawneer, US Aluminum, Vistawall, or approved.
C. Stile Width: 3-1/2 inches

2.7 GLAZING STOPS

A. Material: Match Frame Stock.
B. Shape: Beveled

2.8 DOOR HARDWARE

A. See Section 08-71-00

2.9 DOOR WEATHERSTRIPPING

A. Material: Flexible nonporous Polymeric Strip
B. Features:
1. All Weatherstripping: Easily replaceable
2. Sill Weatherstripping: Easily adjustable for wear

2.10 ACCESSORIES

A. Provide Attachment Embeds, Flashings, Break-metal Closures, Connectors, Trim, etc. necessary for complete, weatherproof, and secure installation.

2.11 FABRICATION

A. Comply with applicable portions of Referenced Specifications.
B. Hardware Mounting Heights: See Mounting Heights Drawing in Section 08-71-00.
C. Provide concealed Steel Reinforcement where indicated or required to resist Wind or other Applied Loads.
D. Fabricate Connections as required for strength and rigidity using concealed Mechanical Fastenings wherever possible. Where not possible, welding may be used.
E. Drain Glazing Channels to prevent Insulating Glass from standing in Water.
F. Fabricate with Weep Holes to evacuate to Building Exterior any exterior Water or interior Condensation.
G. Cut Horizontal Members between Vertical Members.
H. Match exposed Welds with adjacent Material, free of porosity, cracks, and blow-holes.
I. Select Materials carefully for matching Color and Texture after finishing.
J. Fabricate Flat Surface smooth and true, and free from waves, buckles, and seams.
K. Fabricate Edges, Corners, and Angles clean, sharp, and square.
L. Fit Members with hairline, virtually invisible joints.
M. Allow for expansion and contraction.
N. Prevent Noise resulting from thermally-induced Material movement, Vibration harmonics, or Wind passage.
O. Make Exterior Work permanently weathertight.
P. Fabricate with the following clearances:
1. Between Doors & Frames: 1/8 inch
2. Between Door Bottoms & Thresholds: 1/4 inch
3. Between Door Bottoms & Floor: 3/4 inch

PART 3 – EXECUTION

3.1 EXISTING CONDITIONS

A. Verify that Openings to receive Work of this Section are plumb, rigid, accurately sized and located, and otherwise properly prepared.
B. Prior to starting Work, notify General Contractor about defects requiring correction.
C. Do not start Work until conditions are satisfactory.

3.2 PROTECTING WORK OF OTHER SECTIONS

A. Protect against damage and discoloration caused by Work of this Section.

3.3 CORROSION PROTECTION

A. Coat contacting Dissimilar Materials with Corrosion Insulating Compound, 7-1/2 mil dry film thickness, minimum, applied to each Contacting Face.

3.4 INSTALLATION

A. Follow Manufacturer's instructions, approved Shop Drawings, and applicable portions of Referenced Specifications.
B. Install plumb, square, true, rigid, secure, weather tight, and in alignment with adjacent Other Work.

3.5 ALLOWABLE INSTALLATION TOLERANCES

A. Member Alignment:
    1. True within 1/8 inch per 12 feet.
B. Openings:
    1. Accurately size and locate within 1/4 inch.
    2. Squareness: 1/8 inch maximum difference between opposite Diagonal Measurements.

3.6 ADJUSTMENTS

A. Adjust Moving Parts to operate satisfactorily at time of Project Substantial Completion and during Warranty Period.

3.7 TOUCH-UP PAINTING

Touch-up any exposed Metal Finish damaged by cutting. Match adjacent Finish.

3.8 WASTE MANAGEMENT

A. Collect and place Scraps and Packaging Waste where directed for recycling.

3.9 PRODUCT CLEANING & REPAIRING

A. Remove Protective Coatings.
B. Including Work of other Trades, clean, repair and touch-up, or replace when directed, Products which have been soiled, discolored, or damaged by work of this Section.
C. Remove Debris from Project Site upon work completion or sooner, if directed.

END OF SECTION

SECTION 08 51 23.23 - COLD-ROLLED STEEL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-rolled steel windows.

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for borrowed-lite interior steel windows.
2. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for on-site painting of factory prime-coated windows.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements for cold-rolled steel windows, including, but not limited to, the following:

a. Coordinating finishing of cold-rolled steel windows with other work where color and finish matching is indicated.
b. Coordinating cold-rolled steel windows with other exterior wall components, including anchorage, glazing, flashing, weeping, air barriers, sealants, and protection of finishes.
c. Sequencing work to construct a watertight and weathertight exterior building enclosure.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.

B. Shop Drawings:

1. Plans, elevations, sections, and details.
2. Detail attachments to other work, and between units, if any.

3. Hardware and required clearances.
4. Mullion details, including reinforcement and stiffeners.
5. Munton details.
6. Flashing details.
7. Glazing details.
8. Accessories.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for units with factory-applied color finishes.

1. Include available color or finish selections for hardware and accessories.

D. Samples for Verification: Actual sample of finished products for each type of cold-rolled steel window including weather stripping, glazing bead, and hardware.

1. Size: Manufacturers' standard size.

E. Product Schedule: For cold-rolled steel windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Product Test Reports: For each cold-rolled steel window, for tests performed by a qualified testing agency.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

C. Qualification Statements: For Installer, manufacturer and testing agency.

D. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cold-rolled steel windows.

B. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturers: A manufacturer capable of fabricating cold-rolled steel windows that meets performance requirements indicated and of documenting performance by labels, test reports, and calculations.
2. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace components of cold-rolled steel windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period:

a. Window: Three years from date of Substantial Completion.
b. Finish: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain cold-rolled steel windows from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. SWI Standards: Comply with applicable requirements in SWI's "Architect's Guide to Steel Windows and Doors" and "Specifications - Formed Cold Rolled Sections," except where more stringent requirements are indicated.

B. Structural Wind Loads: As indicated on Drawings.

C. Deflection Limits: Design glass framing system to limit deflection of glass edges in a direction perpendicular to glass plane to less than 1/175 of glass-edge length for each individual glazing light or 3/4 inch, whichever is less, at design pressures.

D. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, cold-rolled steel windows do not evidence deflection exceeding specified limits.
2. When tested at [150] percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding [0.2] percent of span.
3. Test Durations: As required by design wind velocity, but not less than [10] seconds.

E. Air Leakage for Weather-Stripped Sash: Not more than [0.37 cfm/ft.] of sash crack length at a differential pressure across the windows of [6.24 lbf/sq. ft.] when tested in accordance with ASTM E283/E283M.

F. Water Penetration for Weather-Stripped Sash: No leakage for 15 minutes when window is subjected to a rate of flow of 5 gal./h/sq. ft. with a differential pressure across the window of [2.86 lbf/sq. ft.] when tested in accordance with ASTM E331.

G. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of [0.80 Btu/sq. ft. x h x deg F].

H. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of [0.70].

I. Condensation Resistance: Provide cold-rolled steel windows with a CR of [33] minimum, determined in accordance with NFRC 500.

J. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.

K. Forced-Entry Resistance: Comply with Performance [Grade 10] requirements when tested in accordance with ASTM F588.

L. Windborne-Debris-Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone [1] for [basic] protection.

1. Large-Missile Test: For glazing located within [30 ft.] of grade.
2. Small-Missile Test: For glazing located between 30 ft. and [60 ft.] above grade.

M. Fire-Test-Response Characteristics: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

2.3 COLD-ROLLED STEEL WINDOWS

A. Manufacturers: Subject to compliance with requirements, provide products by one of

the following:

1. Fyre-TEC
2. Hope's Windows, Inc.
3. Optimum Window Mfg Corp

B. Operating Types: Provide the following window types in locations indicated on Drawings:

1. Fixed.

C. Frames and Sashes: Provide frame and sash members mechanically formed from metallic-coated, low-carbon, cold-rolled steel sheet complying with ASTM A653/A653M. Comply with SWI specifications for combined weight of frame and sash members and front-to-back depth of frame or sash members.

1. Thermally Broken Design: Provide frame and sash members designed to isolate interior and exterior surfaces for improved thermal performance.

D. Window Finish: Primed for field painting.

1. Color: To Match Adjacent Existing.

E. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

F. Mullions: Formed of cold-rolled steel matching window units; with anchors for support to structure and for installation of window units and having sufficient strength to withstand design pressure indicated. Provide mullions of profile indicated and with cover plates. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections.

G. Sill Cap/Track: Designed to comply with performance requirements indicated and to drain to the exterior.

H. Glazing Stops: Provide snap-on glazing stops; coordinate with Section 088000 "Glazing" and with glazing system indicated. Provide glazing stops to match panel frames. Finish glazing stops to match window units if fabricated of steel; otherwise, provide manufacturer's standard finish.

I. Weather Stripping: Manufacturer's standard compressible weather stripping, complying with AAMA 701/702, ASTM C509, or ASTM C864 and designed for permanently resilient sealing under compression and for complete concealment when sash is closed.

2.4 GLAZING

A. Glass and Glazing System: See Section 088000 "Glazing" for glass units and glazing requirements for cold-rolled steel windows.

2.5 ACCESSORIES

A. Fasteners: Provide fasteners of bronze, brass, stainless steel, or other metal that are warranted by manufacturer to be noncorrosive and compatible with trim, hardware, anchors, and other components of cold-rolled steel windows.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

B. Anchors, Clips, and Window Accessories: Provide units of stainless steel, hot-dip zinc-coated steel, bronze, brass, or iron complying with ASTM A123/A123M. Provide units with sufficient strength to withstand design pressure indicated.

1. Windborne-Debris-Impact Resistance: Provide anchors and clips of same design used to pass windborne-debris-impact-resistance testing.

C. Sealant: For sealants required within fabricated windows, provide manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.6 FABRICATION

A. Fabricate cold-rolled steel windows of type and in sizes indicated to comply with SWI standards. Include a complete system for assembly of components and anchorage of window units.

B. Provide units that are reglazable without dismantling framing.

C. Prepare windows for site glazing.

D. Subframes and Operable Sash: Formed of cold-rolled steel of profile indicated. Miter or cope corners, and weld and dress joints smooth.

E. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

F. Provide weep holes and internal water passages to conduct infiltrating water to the exterior.

G. Provide water-shed members above casement sash.

2.7 METALLIC-COATED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with

SSPC-Paint 20, to comply with ASTM A780/A780M.

B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough-opening dimensions, levelness of sill plate and clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF COLD-ROLLED STEEL WINDOWS

A. SWI Publication: Comply with applicable requirements in SWI's "Guidelines on How to Install Steel Windows," except where more stringent requirements are indicated.

B. Comply with manufacturer's written instructions for installing windows, hardware, operators, accessories, and other components.

C. Windborne-Debris-Impact Resistance: Anchor cold-rolled steel windows required to have windborne-debris resistance to structure using method, anchor type, and anchor spacing identical to that used in windborne-debris-impact-resistance testing.

D. Install windows level, plumb, square, true to line, without distortion or impediment to thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

E. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

F. Install windows and components to drain condensation, water-penetrating joints, and moisture migrating within windows to the exterior.

G. Separate corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E2112.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Test windows for air leakage and water penetration in accordance with AAMA 502, Test Method [A], by applying same test pressures required for performance.
2. Testing Extent: [Three] windows as selected by Architect and a qualified independent testing and inspecting agency. Test windows immediately after installation.
3. Window will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts as recommended in writing by manufacturer.

B. Clean factory-finished steel surfaces immediately after installing windows. Comply with manufacturer's written instructions for final cleaning and maintenance. Avoid damaging protective coatings and finishes.

C. Protect window surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately in accordance with manufacturer's written instructions.

D. Refinish or replace windows with damaged finish.

END OF SECTION

SECTION 08 56 19 - SERVICE WINDOWS

PART 1 - GENERAL

1.1 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Illustrate products, installation, and relationship to adjacent construction.
   2. Product Data: Manufacturer's descriptive data and product attributes.
   3. Samples: Verification samples.

1.2 WARRANTY

A. Manufacturer's one year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by QuikServ Inc. 11441 Brittmoore Park Drive, Houston, TX 77041, Toll-Free: 800-388-8307, Tel: 713-849-5882, Fax: 713-849-5708, www.quikserv.com, email: sales@quikserv.com.

B. Substitutions: Refer to Division 01.

2.2 MANUFACTURED UNITS, GENERAL

A. Type: Extruded aluminum-framed, horizontal-sliding, manual-opening, self-closing, transaction window unit.
   1. Track: Top-hung with no bottom track.
   2. Slides: Stainless steel slide rail, ball bearing type.
   3. Frame Depth: 4-1/2 inches, unless otherwise indicated.

2.3 SELF-CLOSING WINDOWS

A. Type: Self-closing transaction window unit.
   1. Product: SC-4030
   2. Functionality: Single
   3. Finish: Clear Anodized
   4. Glazing: Tempered
   5. Placement: Flush mount
   6. Actual Size (w x h): 4'-0" x 5'-0"

2.4 HARDWARE

A. Hardware:
   1. Latch: Manufacturer’s standard spring latch with manual pull and thumb release which automatically locks on closing.

2.5 GLAZING

A. Glass:
   1. Tempered Glass: ASTM C1048; Type I; Quality-Q3; Kind FT; Class 1 clear.
      a. Tint Color: Amber.
   2. Insulating-Glass Units: Factory-assembled units, qualified according to ASTM E2190.
      a. Outer Lite: 4 mm (5/32 inch) clear fully tempered.
      b. Interstitial Space: 5/16 inch (7.5 mm) air.
      c. Inner Lite: 4 mm (5/32 inch) clear fully tempered.

2.6 MATERIALS

A. Extruded Aluminum: ASTM B 221; alloy and temper recommended by manufacturer for type of use and finish indicated

B. Stainless Steel: ASTM A240, Type 304.

2.7 FINISHES

A. Anodized Aluminum Finish: AAMA 611, Architectural Class II anodized, Clear

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved Shop Drawings.

END OF SECTION

SECTION 086200 - UNIT SKYLIGHTS

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Dynamic dome unit skylight with formed curb counterflashing for mounting on site-built or prefabricated roof curbs, for flat, low-slope and steep-slope roofing applications.

B. Related Sections:
1. Division 06 Section "Rough Carpentry" for rough opening framing and shims.
2. Division 07 Section "Self-Adhering Vapor-Permeable Air-Barrier Membrane" for sealinh frame to weather barrier installed on adjacent construction.
3. Division 07 Section "Joint Sealants" for sealing joints between window frames and adjacent construction.
4. Division 08 Section "Glazing."

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.

D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

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. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments

and Supplements.

I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

K. ASTM 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; 2004 (Reapproved 2012).

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 2016).

M. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).

N. 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.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site one week before starting work of this Section.

1.05 SUBMITTALS

A. Product Data: Provide component dimensions, information on glass and glazing, and internal drainage details.

B. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, window details and installation requirements.

C. Samples: Submit two samples, 12 by 12 inch (300 by 300 mm) in size illustrating typical corner construction, accessories, and finishes.

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. 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. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

J. 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 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.

1.07 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.

1.08 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.

1.09 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of skylights that fail in materials or workmanship under normal use within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of metals, metal finishes, dome, and other materials beyond normal weathering.

b. Breakage of polycarbonate glazing.
c. Product leaks.

2. Warranty Period:

a. 15 Years: Polycarbonate dome skylights including water penetration and hail breakage for hailstones 2 inches and less in diameter. Mill finished aluminum skylight frames.

b. 10 Years: Yellowing of acrylic and polycarbonate skylight domes.
c. 5 Years: Acrylic and impact modified acrylic dome skylights, skylight model CDS with polycarbonate dome, aluminum curbs, external safety cage, internal safety screen accessory, internal security bars accessory, ventilation curb extension.
d. 1 Year: Steel curb.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products of VELUX America LLC, Greenwood, SC 29648, www.veluxusa.com.

B. Substitutions: As permitted under Instructions to Bidders and Section 012500 "Substitution Procedures".

C. Source Limitations: Obtain unit skylights through single source from single manufacturer.

2.2 DYNAMIC DOME UNIT SKYLIGHT Curb Mount Model CMD-

A. System Description: Dynamic dome, curb mounted fixed skylight utilizing extruded aluminum frame counter-flashing with welded corners, a PVC inner frame allowing condensation drainage, structural sealant, integral double sided insulated aluminum curb and accessories, as required to meet installation and performance requirements indicated. Dynamic dome skylights shall be suitable for installation on roof pitches ranging from 0 degrees up to 60 degrees from horizontal.

1. Basis of Design: VELUX America LLC, Model CMD- Dynamic Dome Skylight.

B. Dynamic Dome: Height 30% of skylight width, vacuum formed with precise repeating geometric patterns, and overall shape to maximize strength and daylight at low solar elevation angles 10 to 40 degrees. Outer dome shall be formed from smooth sheet and not prismatic in order to transmit all incident daylight through outer dome. Initial rise of the dome shall be at an angle of at least 60 degrees to horizontal in order to harvest daylight at low solar elevation angles 10 through 40 degrees. Provide polycarbonate domes with integral UV blocking cap layer that prevents long-term yellowing, and insures material strength and performance stability. Light diffusion 100%.

1. Double dome:
   a. Polycarbonate (LuxGuard) – Outer dome clear polycarbonate, 0.118 inches in thickness with UV blocking cap layer. Inner dome white prismatic polycarbonate, 0.118 inches in thickness

C. Aluminum Frame Counter-flashing: Maintenance-free, extruded aluminum, grade 6063-T6, 0.08 inch (2.0 mm) thick with mill finish. Counter-flashing frames completely welded in corners and counter flashes curb a minimum of 1.625 inches (41 mm). Provide aluminum frame with at least 0.5 inch (12 mm) continuous ledge on each side of the skylight that is a pinch free access for stacking, manual transportation and mounting of skylights.

1. Unit Sizes: 2448.

D. 100% Thermally Broken PVC inner-frame for Condensation Drainage: Factory applied white PVC inner-frame assembly providing a thermal break weather seal and drainage for condensation. The inner-frame design allows positive condensation to the exterior of the curb without exposed drainage openings in the aluminum frame that can introduce air infiltration into the skylight. The PVC inner-frame construction consists of coextruded fins allowing for a dry installation of skylight to the curb, eliminating weather seal strips or caulking at the top of the curb.

E. Structural Sealant: Factory applied InstantGlaze sealant, bonding the dome to the aluminum frame and suitable for external exposure.

F. Deck Mount Aluminum Curb: Factory installed and insulated aluminum curb, 1.5 inches in thickness with 22 gauge (0.025”) white finished aluminum interior and 20 gauge (0.032”) mill finished aluminum exterior. Curb factory insulated with 1.5 inches of expanded polystyrene board having a 5.8 R-Value. Width and length of curb shall be 2448 with 9 inch curb height. Curb roof mounting flange shall be a minimum 2.75 inches in width.

2.3 ACCESSORIES-CURBS:

A. Steel Curb: Curb width and length designation shall be 2448. Curb height shall be 9 inches and nominal curb thickness shall be 1.5 inches.

1. Factory Insulated Curb: Factory engineered steel curb fabricated from 14 gauge galvanized steel with fully welded corners, all welds factory primed with galvanized paint, and continuous 2 inch by 2 inch nominal pressure treated wood nailer mounted to the top flange of the curb. Curb is factory insulated with 1.5 inch thick, 3 pound density fiberglass insulation. Interior liner of curb fabricated from 20 gauge steel and primed white. Curb roof mounting flange shall be a minimum of 3 inches in width. Basis of Design: VELUX America LLC Model, CCA3.

2.4 ACCESSORIES-FALL PROTECTION AND SECURITY

A. Interior safety screen accessory: Fall protection safety screen constructed from 0.1875 inch steel mesh with a 6 inch on center grid spacing welded to 18 gauge steel z-bar support frame continuous on each side with welded corners. Interior safety screen frame mounts to top of 1.5 inches curb with safety screen mesh located not more than 1.5 inches below top of curb. Safety screen factory are galvanized finish. Safety screen shall meet fall protection requirements by supporting a minimum static load of 400 pounds per square foot. Basis of Design: VELUX America LLC, Model CRGA ICD.

2.5 PERFORMANCE REQUIREMENTS

A. Unit Skylight Standard, Dynamic Dome model CMD2 certified to AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS-17 or previous) as follows:

1. Design Pressure (DP): Minimum DP = +/- 30 psf (+/- 1.44 KPa). Dome shall not invert at positive design pressure.

2. Water Test Pressure: Minimum 15 psf (720 Pa) with no leakage at 5 gallons per minute spray rate.

3. Air Leakage Rate: Maximum 0.061 cfm/ft^2 (0.3 L/s/m^2)

B. Daylighting: Provide daylighting photometric performance comparable to basis of design product at layout indicated, based upon daylighting profile of March 21, 9:00 am local time, at Project location by simulation in accordance with IESNA guidelines.

C. Windborne-Debris Resistance:
1. Provide unit skylights capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing glazed units representative of those specified, according to ASTM E 1886 and ASTM E 1996. Missile Level D, and +80/-80 psf cycle pressure.

D. Fire Testing for Roof Assemblies with Fire Classifications: Polycarbonate unit skylight tested in accordance with and listed as passing Class A Burning Brand test as described in ASTM E 108.

E. Dome Burn Rate: Tested in accordance with ASTM D 635 with a documented rating of CC1 for LuxGuard

F. Dome Smoke Density Rating: Testing in accordance with ASTM D 2843 with a documented performance value less than or equal to 75.

G. Dome Self-Ignition Temperature: Tested in accordance with ASTM D 1929 with a documented performance value greater than or equal to 650 degrees Fahrenheit.

H. Factory Mutual: Skylights Factory Mutual 4431 approved.

I. Dome Hail Resistance: Exterior dome tested in accordance with Factory Mutual 4430 to meet severe hail with 2.0 inch ice balls.

J. Energy Performance ratings for any size commercial CMD- curb mounted unit skylight with dynamic dome as follows:

1. Thermal Transmittance: NFRC 100 maximum U-factor:

a. Double Dome:
1) LuxGuard (CMD2 DMD2 P1C2): 0.65
2)

2. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum SHGC:

a. Double Dome:
1) LuxGuard (CMD2 DMD2 P1C2): 0.46

3. Visible Light Transmittance (VLT) and Percent Haze: ASTM D 1003:

a. Double Dome:
1) LuxGuard (CMD2 P1C2): VLT = 61.9%, Haze = 100%

K. Fall Protection Standard Compliance: 29 CFR 1910.29: Skylight safety screen tested to support a minimum of 400 pounds over 1 square foot of the surface.

2.6 MATERIALS

A. Joint Sealants: As specified in Section 079200 "Joint Sealants."

B. Mastic Sealants: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with unit skylight installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install unit skylights in accordance with manufacturer's written instructions and approved shop drawings. Coordinate installation of units with installation of substrates, air and vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that finished installation is weather tight.

1. Anchor unit skylights securely to supporting substrates.
2. Install unit skylights on curbs specified in another section with tops of curbs parallel to finished roof slope.

B. Where metal surfaces of unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.

C. For custom flashings, install unit skylight curb counter-flashing to produce weatherproof seal with curb and overlap with roofing system termination at top of curb.

3.3 FIELD QUALITY CONTROL

A. Work will be considered defective if it does not pass inspections.

B. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Prepare inspection reports.

3.4 CLEANING AND PROTECTION

A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Replace glazing that has been damaged during construction period.

C. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum and hollow metal doors.

B. Hardware for fire-rated doors.

C. Lock cylinders for doors with balance of hardware specified in other sections.

D. Thresholds.

E. Weatherstripping and gasketing.

F. Key lock boxes

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 081416 - Flush Wood Doors.

C. Section 084113 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.

C. BHMA A156.1 - Standard for Butts and Hinges 2021.

D. BHMA A156.2 - Bored and Preassembled Locks and Latches 2017.

E. BHMA A156.3 - Exit Devices 2020.

F. BHMA A156.4 - Door Controls - Closers 2019.

G. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.

H. BHMA A156.6 - Standard for Architectural Door Trim 2021.

I. BHMA A156.7 - Template Hinge Dimensions 2016.

J. BHMA A156.8 - Door Controls - Overhead Stops and Holders 2021.

K.

L. BHMA A156.16 - Auxiliary Hardware 2018.

M. BHMA A156.18 - Materials and Finishes 2020.

N. BHMA A156.21 - Thresholds 2019.

O. BHMA A156.22 - Standard for Gasketing 2021.

P. BHMA A156.28 - Recommended Practices For Mechanical Keying Systems 2018.

Q. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.

R. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.

S. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.

T. DHI (KSN) - Keying Systems and Nomenclature 2019.

U. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.

V. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also, in WDHS-1/WDHS-5 Series, 1996.

W. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

X. ITS (DIR) - Directory of Listed Products Current Edition.

Y. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

Z. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.

AA. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

BB. UL (DIR) - Online Certifications Directory Current Edition.

CC. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

DD. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Architect.
   2. Supplier's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Schedule meeting with Owner prior to Contractor occupancy.
   2. Attendance Required:
      a. Owner.
   3. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
      c. Verify that keying and programming complies with project requirements.
      d. Establish keying submittal schedule and update requirements.
   4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   5. 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.
   6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

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

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
      a. Submit in vertical format.
   3. Include complete description for each door listed.

D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
   2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Supplier's qualification statement.

I. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

J. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

K. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

L. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

M. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Locks: Provide a lock for each door, unless it's indicated that lock is not required.
   1. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's Series. As indicated in hardware sets.
   2. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.
   3. Strikes:
      a. Finish: To match lock or latch.
      b. Curved-Lip Strikes: Provide as standard, with extended lip to protect frame, unless otherwise indicated.
      c. Center Strike At Pairs of Doors: 7/8 inch (22.2 mm) lip.

D. Closers:
   1. Provide door closer on each exterior door, unless otherwise indicated.
   2. Provide door closer on each fire-rated and smoke-rated door.
   3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.

E. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.

F. Thresholds:
   1. Exterior Applications: Provide at each exterior door, unless otherwise indicated.

G. Weatherstripping and Gasketing:
   1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   2. Provide door bottom sweep on each exterior door, unless otherwise indicated.

3. Provide applicable gasketing on doors as indicated in hardware sets.

H. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
a. Aluminum fasteners are not permitted.
b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
a. Self-drilling (Tek) type screws are not permitted.
3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

I. Key Lock Boxes:
1. Provide key lock boxes designed for storage of ten keys.
2. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. Knox Company
3. Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.

2.02 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or as suitable for application indicated.
5. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.
9.

2.03 HINGES

A. Manufacturers: Conventional butt hinges.
1. BEST; dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
1. Butt Hinges: As applicable to each item specified.

a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
c. Template screw hole locations.
d. Bearing assembly installed after plating.
e. Bearings: Exposed fully hardened bearings.
f. Bearing Shells: Shapes consistent with barrels.
g. Pins: Easily seated, non-rising pins.
    1) Fully plate hinge pins.
    2) Non-Removable Pins: Slotted stainless steel screws.
h. UL 10C listed for fire-resistance-rated doors.

C. Sizes: See Door Hardware Schedule.
1. Hinge Widths: As required to clear surrounding trim.
2. Sufficient size to allow 180 degree swing of door.

D. Finishes: See Door Hardware Schedule.
1. Fully polish hinges, front, back, and barrel.

E. Grades:
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
2. Comply with BHMA A156.18 Materials and Finishes.

F. Material: Base metal as indicated for each item by BHMA material and finish designation.

G. Types:
1. Butt Hinges: Include full mortise hinges.

H. Options: As applicable to each item specified.

I. Quantities:
1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
    a. Hinge weight and size unless otherwise indicated in hardware sets:
        1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
        2) For doors from 36 inches (914 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
        3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
        4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.

J. Applications: At swinging doors.
1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

K. Products:
1. Butt Hinges:
    a. Ball Bearing, Five (5) Knuckle.

2.04 LOCK CYLINDERS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. Substitutions: Not permitted.

B. Properties:
   1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
      a. Provide cylinders from same manufacturer as locking device.
      b. Provide cams and/or tailpieces as required for locking devices.
      c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Grades:
   1. Standard Security Cylinders: Comply with BHMA A156.5.

D. Material:

E. Types: As applicable to each item specified.
   1. Standard security small format interchangeable core (SFIC) type cylinders, with seven-pin, 1C - 7-pin cores.

F. Applications: At locations indicated in hardware sets, and as follows
   1. As required for items with locking devices provided by other sections, including elevator controls and cabinets.
      a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.

G. Products: As listed in hardware sets.

2.05 CYLINDRICAL LOCKS

A. Manufacturers:
   1. dormakaba commercial, dormakaba Group: www.dormakaba.com/us-en/#sle.
   2. Substitutions: Not permitted.

B. Properties:
   1. Mechanical Locks:
      a. Fitting modified ANSI A115.2 door preparation.
      b. Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
      c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
         1) Through-bolted anti-rotational studs.
      d. Bored Hole: 2-1/8 inch (54 mm) diameter.
      e. Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
      f. Latch: Single piece tail-piece construction.
         1) Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
      g. Cylinders:
         1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
      h. Lever Trim:

1) Style: See Door Hardware Schedule.
2) Outside Lever Sleeve: Seamless one-piece construction.

C. Finishes: See Door Hardware Schedule.
1. Core Faces: Match finish of lockset.

D. Grades: Comply with BHMA A156.2, Grade 1.

E. Material: Manufacturer's standard for specified lock.

F. Options: Construction Keying.

G. Products: Cylindrical locks, including mechanical types.
1. QCL100 (Grade 1).

2.06 CLOSERS

A. Manufacturers:
1. dormakaba commercial, dormakaba Group: www.dormakaba.com/us-en/#sle.
2. Substitutions: Not permitted.

B. Properties:
1. Surface Mounted Closers: Manufacturer's standard.
a. Construction: Cast iron.
b. Maximum Projection from Face of Door: 2-7/16 inches (62 mm).
c. Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.
1) Include delayed action feature.
d. Hydraulic Fluid: All-weather type.
e. Arm Assembly: Standard for product specified.
1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
2) Parallel arm to be a heavy-duty rigid arm.
3) Where “IS” or “S-IS” arms are specified in hardware sets, if manufacturer does not offer this arm provide a regular arm mount closer in conjunction with a heavy-duty overhead stop equal to a dormakaba 900 Series.
f. Covers:
1) Type: Standard for product selected.
(a) Full.
2) Material: Plastic.
3) Finish: Painted.

C. Grades:
1. Closers: Comply with BHMA A156.4, Grade 1.
a. Underwriters Laboratories Compliance:
1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
(a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.

D. Types:
1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.

E. Options:
1. Delayed action, adjustable with an independent valve.

F. Installation:

1. Mounting: Includes surface mounted installations.
2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
3. At outswinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

G. Products:
   1. Surface Mounted:
      a. QDC100.

2.07 PROTECTION PLATES

A. Manufacturers:
   1. Trimco: www.trimcohardware.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
   1. Plates:
      a. Armor Plates: Provide on bottom half of push side of doors that require protection from objects moving through openings that may damage door surface.
         1) Size: 34 inches (854 mm) high by 1 inch (38 mm) less door width (LDW) on pull side and 2 inch (51 mm) LDW on push side of door.
      b. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
         1) Size: 10 inches (254 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.
      c. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
   1. Metal Properties: Stainless steel.
      a. Metal, Standard Duty: Thickness 0.050 inch (1.27 mm), minimum.

E. Installation:
   1. Fasteners: Countersunk screw fasteners

F. Products: As listed in hardware sets.

2.08 OVERHEAD STOPS AND HOLDERS

Manufacturers:

Architectural Builders Hardware Mfg. (ABH); www.abhmfg.com/#sle.

Substitutions: See Section 016000 - Product Requirements.

Properties:

Stop Settings: At 85 degrees opening.

Adjustable friction tension.

Sizes: Manufacturer’s standard for the application.

Finishes:

Arms and Brackets: Zinc-plated.

Grades: As applicable to item specified.

Comply with BHMA A156.8, Grade 1.

Material: Base metal as indicated for each item by BHMA material and finish designation.

Track Channel: Extruded aluminum alloy.

Slide Block: Machined from solid brass alloy.

Types:

Surface-applied.

Products:

Surface Overhead Stops and Holders:

ABH 4420 & 9020 Series.

2.09STOPS AND HOLDERS

A. Manufacturers:
   1. Architectural Builder Hardware(ABH): www.abhmfg.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Grades:
   1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

D. Material: Base metal as indicated for each item by BHMA material and finish designation.

E. Types:
   1. Floor Stops: Provide with bumper floor stop.

F. Installation:
   1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

G. Products:
   1. Wall Bumpers.
   2. Floor Stops.

2.10 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. National Guard Products, Inc: www.ngpinc.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
   1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
   2. Adhesive-Backed Perimeter Gasketing: Silicone gasket material applied to frame with self- adhesive.

C. Grades: Comply with BHMA A156.22.

D. Products:
   1. Gasketing: As listed in hardware sets.

2.11 KEYS AND CORES

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. Substitutions: Not permitted.

B. Properties: Complying with guidelines of BHMA A156.28.
   1. Provide small format interchangeable core.
   2. Provide Patented CORMAX keys and cores.
   3. Provide keying information in compliance with DHI (KSN) standards.
   4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
   5. Keying: Master keyed.
   6. Include construction keying and control keying with removable core cylinders.
   7. Supply keys in following quantities:
      a. Master Keys: 4 each.
      b. Construction Master Keys: 6 each.
      c. Construction Keys: 15 each.
      d. Construction Control Keys: 2 each.
      e. Control Keys if New System: 2 each.
   8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
   9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
   10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
   11. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:
   1. Patented:
      a. CORMAX.

2.12 FINISHES

A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer's fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list, unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. For Steel Doors and Frames: See Section 6549.
   3. For Steel Door Frames: See Section 081213.
   4. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
   5. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
   6. Flush Wood Doors: See Section 081416.
   7. Stile and Rail Wood Doors: See Section 081433.
   8. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch (1024 mm).
      b. Push Plates/Pull Bars: 42 inch (1067 mm).
      c. Deadlocks (Deadbolts): 48 inch (1219 mm).
      d. Exit Devices: 40-5/16 inch (1024 mm).
      e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal, anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation activities.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

D. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.04 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

Manufacturer List

Code	Name
AB	ABH Manufacturing Inc.
BE	Best Access Systems
NA	National Guard
SH	dormakaba Commercial Hardware
ST	BEST Hinges and Sliding
TR	Trimco

Option List

Code	Description
1/4-20 SSMS/EA	Stainless Machine Screws w/Expansion anchors
B4E	Beveled 4 Edges
CK	Construction Keyed
CSK	Counter Sunk Screw Holes
N	Stainless Steel Components
SIA	Abrasive Coating

Finish List

Code	Description
26D	Satin Chrome
32D	Satin Stainless Steel
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
AL	Aluminum
US32D	Stainless Steel, Dull

Hardware Sets

Set #1.0

Doors: 100A

6	Butt Hinge	FBB191 4.5" x 4.5" NRP	32D	ST
1	Keyed Mullion	QRM111 KR 8'0"	689	SH
2	Exit Device	QED112	626	SH
1	Exit Trim	QET160 E	626	SH
1	Exit Trim	QET120 E	626	SH
3	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	626	BE
2	Door Closer	QDC115	689	SH
2	Overhead Stop	N 9024 RA		
	US32D	AB		
2	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mullion Seal	5100N		NA
1	Drip Cap	16A - 4" ODW		NA
2	Weatherstrip	160SA Head & Jambs		NA
2	Door Sweep	200NA		NA
2	Handicap Threshold	713A 1/4-20 SSMS/EA SIA	AL	NA

Set #2.0

Doors: 105, 106B, 106C

6	Butt Hinge	FBB191 4.5" x 4.5" NRP	32D	ST
1	Keyed Mullion	QRM111 KR 8'0"	689	SH
2	Exit Device	QED112	626	SH
1	Exit Trim	QET170 E	626	SH
2	Mortise Cylinder	1E-74 PATD	626	BE
2	Rim Cylinder	12E-72 PATD	626	BE
2	Door Closer	QDC115	689	SH
2	Overhead Stop	N 9024 RA		
	US32D	AB		
2	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mullion Seal	5100N		NA
1	Drip Cap	16A - 4" ODW		NA
2	Weatherstrip	160SA Head & Jambs		NA
2	Door Sweep	200NA		NA
2	Handicap Threshold	713A 1/4-20 SSMS/EA SIA	AL	NA

Set #3.0

Doors: 100C, 101,

3	Butt Hinge	FBB191 4.5" x 4.5" NRP	32D	ST
1	Entry/Office Lockset	QCL151 E CK	626	SH
1	Permanent Core	1C-7A2	626	BE
1	Door Closer	QDC115	689	SH
1	Overhead Stop	N 9024 RA		
	US32D	AB		

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1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Drip Cap	16A - 4" ODW		NA
1	Weatherstrip	160SA Head & Jambs		NA
1	Door Sweep	200NA		NA
1	Handicap Threshold	713A 1/4-20 SSMS/EA SIA	AL	NA

Set #4.0

Doors: 102, 109, 110

3	Butt Hinge	FBB191 4.5" x 4.5" NRP	32D	ST
1	Exit Device	QED112	626	SH
1	Exit Trim	QET160 E	626	SH
2	Mortise Cylinder	1E-74 PATD	626	BE
1	Door Closer	QDC115	689	SH
1	Overhead Stop	N 9024 RA		
	US32D	AB		
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Drip Cap	16A - 4" ODW		NA
1	Weatherstrip	160SA Head & Jambs		NA
1	Door Sweep	200NA		NA
1	Handicap Threshold	713A 1/4-20 SSMS/EA SIA	AL	NA

Set #5.0

Doors: 103, 104,

3	Butt Hinge	FBB191 4.5" x 4.5" NRP	32D	ST
1	Storeroom Lockset	QCL171 E CK	626	SH
1	Permanent Core	1C-7A2	626	BE
1	Door Closer	QDC115	689	SH
1	Overhead Stop	N 9024 RA		
	US32D	AB		
1	Drip Cap	16A - 4" ODW		NA
1	Weatherstrip	160SA Head & Jambs		NA
1	Door Sweep	200NA		NA
1	Handicap Threshold	713A 1/4-20 SSMS/EA SIA	AL	NA

Set #6.0

Doors: 106A, 111B

6	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Keyed Mullion	QRM111 KR 8'0"	689	SH
2	Exit Device	QED112	626	SH
1	Exit Trim	QET130 E	626	SH
2	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	626	BE
2	Door Closer	QDC115	689	SH
2	Overhead Stop	N 9024 RA		
	US32D	AB		
2	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mullion Seal	5100N		NA

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2	Gasketing	5050B Head & Jambs		NA

Set #7.0

Doors: 100B, 111A

6	Butt Hinge	FBB179 4.5" x 4.5" NRP	26D	ST
1	Keyed Mullion	QRM111 KR 8'0"	689	SH
2	Exit Device	QED112	626	SH
1	Exit Trim	QET160 E	626	SH
1	Exit Trim	QET120 E	626	SH
3	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	626	BE
2	Door Closer	QDC115	689	SH
2	Overhead Stop	N 9024 RA		
	US32D	AB		
2	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mullion Seal	5100N		NA
2	Gasketing	5050B Head & Jambs		NA

Set #8.0

Doors: 107, 112

3	Butt Hinge	FBB179 4.5" x 4.5" NRP	26D	ST
1	Classroom Lockset	QCL169 E	626	SH
2	Permanent Core	1C-7A2	626	BE
1	Door Closer	QDC115	689	SH
1	Overhead Stop	N 4424 RA		
	US32D	AB		
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Gasketing	5050B Head & Jambs		NA

Set #9.0

Doors: 108

3	Butt Hinge	FBB179 4.5" x 4.5" NRP	26D	ST
1	Exit Device	QED112	626	SH
1	Exit Trim	QET160 E	626	SH
2	Mortise Cylinder	1E-74 PATD	626	BE
1	Door Closer	QDC115	689	SH
1	Overhead Stop	N 9024 RA		
	US32D	AB		
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Gasketing	5050B Head & Jambs		NA

END OF SECTION 087100

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SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Glass products.
   2. Laminated glass.
   3. Insulating glass.
   4. Glazing sealants.
   5. Glazing tapes.
   6. Miscellaneous glazing materials.

B. Related Sections:
   1. Division 08 Section “Hollow Metal Doors and Frames.”
   2. Division 08 Section “Aluminum Framed Entrances and Storefronts.”

1.03 REFERENCES

A. Abbreviations and Acronyms:
   1. FT: Fully Tempered.
   2. GANA: Glass Association of North America.
   3. HS: Heat-strengthened.
   4. IGCC: Insulating Glass Certification Council.
   5. IGMA: Insulating Glass Manufacturers Alliance.
   6. LBNL : Lawrence Berkeley National Laboratories.
   7. Low-E: Low emissivity.
   8. LSG : Light to Solar Gain.
   9. NFRC: National Fenestration Rating Council.
   10. SHGC: Solar Heat Gain Coefficient.
   11. SC: Shading Coefficient.
   12. VLT: Visible Light Transmittance.

B. Reference Standards: This section does not require compliance with standards, but is merely a listing of those used. If compliance is required, statements will be included in the appropriate Section.
   1. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
   2. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

3. ASTM C 1036 - Standard Specification for Flat Glass.
4. ASTM C 1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
5. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass.
6. ASTM C 1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
7. ASTM E 546 - Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units.
8. ASTM E 576 - Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units in the Vertical Position.
9. ASTM E 1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
10. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
11. ANSI Z97.1 - Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings.
12. BS EN 14179 - Glass in building - Heat-soaked thermally-toughened soda lime silicate safety glass.
13. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

1.04 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Laminators: Firms that laminate primary glass with polyvinyl butyral interlayers, either colored, clear, single-layer or multi-layered, various aesthetic and safety purposes. Laminators shall warrant laminated glass to be free from manufacturing defects for a period as required by the School District from date of manufacture. Approved manufacturers shall have certifications including:
   1. Certified Laminator (CLP) of Vitro Architectural Glass Solarban® coated products.
   2. Certified to laminate Kuraray Sentry Glass Plus® interlayers.
   3. Certified to laminate Guardian Industries SunGuard® coated products.

C. Glass Fabricators: Firms that Fabricate glazing assemblies, including insulated glazing units. Fabricated insulated glazing units shall comply with ASTM E2188, E2189, and E2190. Approved manufacturers shall have certifications including:
   1. IGCC: Insulating Glass Certification Council.
   2. IGMA: Insulating Glass Manufacturers Alliance.
   3. SGCC: Safety Glazing Certification Council.
   4. Vitro Architectural Glass CFP: Certified Fabricator Program.
   5. Guardian Select SunGuard Fabricator.

D. Deterioration of Coated Glass: Defects developing from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture or film on interior surfaces of glass.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delaminating material obstructing vision through glass and blemishes exceeding those allowed by referenced laminated glass standards.

G. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

H. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review temporary protection requirements for glazing during and after installation.

1.06 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
   1. Coated glass.
   2. Laminated glass with PVB interlayers.
   3. Insulating glass.

C. Polyvinyl Butyral Interlayers: Two (2) fully laminated samples of each selected PVB interlayer, 12 inches square.

D. Glazing Accessory Samples: For gaskets, sealants, and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

F. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency, and sealant testing agency.
   1. Glass Fabrication Certifications.
   2. Glass Lamination Certifications.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated glass, insulating glass, glazing sealants, and glazing gaskets.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.08 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI/ASQC 9002 1994. Qualified insulating-glass manufacturers shall have a location and equipment that is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations: Obtain glass and glazing materials from one source for each product indicated. Coatings and finished assemblies, such as insulating units and laminated units, to be manufactured by the same fabricator in order to have a common source of warranty.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Install glazing in mockups specified in other Division 08 Sections to match glazing systems required for Project, including glazing methods.
   2. Scheduling: Notify Architect seven days in advance of dates and times when mockups will be available for viewing.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.09 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Protect glass from edge damage during handling. For insulating units exposed to substantial altitude changes, comply with insulating glass manufacturers written recommendations for venting and sealing to avoid hermetic seal ruptures.
   2. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.12 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
   1. Warranty Period: 10 years from date of manufacture.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: 10 years from date of manufacture.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of manufacture.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable 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. Bendheim.
   2. Cardinal Glass Industries.
   3. Guardian Glass.
   4. Hartung Glass.
   5. J.E. Berkowitz.
   6. Northwestern Industries, Inc.
   7. Oldcastle Building Envelope.
   8. Viracon, Inc.
   9. Vitro Architectural Glass.

B. Source Limitations for Glass: Obtain coated glass from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
   a. Fixed glazed storefront assemblies shall have a U-value of not more than 0.38.
   b. Glazed hollow metal storefront entrances shall have a U-value of not more than 0.60.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.03 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
1. Minimum Glass Thickness for Exterior Lites: 6.0 mm.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.04 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   2. Maximum peak to valley rollerwave 0.003 inch in the central area and 0.008 inch within 10.5 inches of the leading and trailing edge
   3. For clear or low-iron glass 1/4 to 3/8 inch thick without ceramic frit or ink, maximum plus or minus 100 mD (millidiopter) over 95 percent of the glass surface.
   4. Maximum bow and warp 1/32 inch per lineal foot.
   5. For uncoated glass, comply with requirements for Condition A.
   6. For coated vision glass, comply with requirements for Condition C (other coated glass).
   7. All tempered safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.
   8. Provide heat soak testing for all fully tempered glass conforming to EN14179 which includes a 2 hour dwell at 290 deg C, plus or minus 10 deg C.

C. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or nitride coating deposited by vacuum deposition process after manufacture and complying with other requirements specified.

D. Insulating Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 2190 and with requirements specified in this Article and in Part 2 Insulating-Glass Units Article.
   1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 Performance Requirements Article.
   2. Provide FT (fully tempered) glass lites where safety glass is indicated or required.
   3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit’s edge.
   4. Sealing System: Comply with requirements in Division 07 Section "Joint Sealants." Dual seal, with primary and secondary sealants of polyisobutylene and silicone.
   5. Spacer Specifications: Manufacturer’s standard spacer material and construction complying with the following requirements:
      a. Spacer Material: Aluminum with black, color anodic finish.

b. Desiccant: Molecular sieve or silica gel, or blend of both.
c. Corner Construction: Manufacturer's standard corner construction.

2.05 LOW-E COATINGS

A. Low-e Coating: Vacuum deposition (sputter-coating) process.

B. Low-e Coating for Insulating Glass, Laminated (IGL) Basis-of-Design Product: Subject to compliance with requirements, provide Vitro Architectural Glass; Solarban 60, or comparable product by one of the following:
1. Bendheim.
2. Cardinal Glass Industries.
3. Guardian Glass; SunGuard SN 68.
4. J.E. Berkowitz.
5. Oldcastle Building Envelope.
6. Viracon, Inc.

2.06 LAMINATED GLAZING (LG)

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

B. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.

C. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with performance requirements for **STC 42**.

2.07 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, or, thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.08 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 790.
      b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      c. May National Associates, Inc.; Bondaflex Sil 290.
      d. Pecora Corporation; 890.
      e. Sika Corporation, Construction Products Division; SikaSil-C990.
      f. Tremco Incorporated; Spectrem 1.

2.09 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.10 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: 100% Silicone to prevent contamination with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Glazing Channel and Stop Profiles: aluminum channels supplied by CR Laurence Co., In., Finishing and Fabrication.
   1. Glazing Channel Profile: Channel; aluminum; WU3BLSL: 1-inch high glazing channel; black powder coat finish.
   2. Glazing Stop Profile: Channel; aluminum; WU1DUSL: 1 1/2-inch high glazing channel; black powder coat finish.

E. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

F. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

G. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.11 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.

3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.03 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.08 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.09 GLAZING SCHEDULE

A. Provide the following glass types, as indicated in elevations on Drawings:
   1. GL-1: Monolithic tempered glass, clear, minimum 1/4 inch thick, typical.
   2. GL-2: Monolithic tempered glass, tinted, minimum 1/4 inch thick, typical.
   3. GL-3: Insulating glass unit (IG) consisting of the following:
      a. Outer Lite: Minimum 1/4 inch thick clear, fully tempered glass with low-e coating on No. 2 surface.
      b. Airspace: Argon.
      c. Inner Lite: Minimum 1/4 inch thick clear, fully tempered glass.
   4. GL-4: Insulating glass unit (IG) consisting of the following:
      a. Outer Lite: Minimum 1/4 inch thick clear, fully tempered glass with low-e coating on No. 2 surface.
      b. Airspace: Argon.
      c. Inner Lite: Minimum 1/4 inch thick clear, fully tempered glass.

END OF SECTION

SECTION 08 83 00 - MIRRORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:
   1. Annealed monolithic glass mirrors.
   2. Tempered glass mirrors qualifying as safety glazing.
   3. Laminated glass mirrors qualifying as safety glazing.

B. Related Sections:
   1. Division 08 Section "Glazing."
   2. Division 10 Section "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.03 ACTION SUBMITTALS

A. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

B. Samples: For each type of the following:
   1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
   2. Mirror Clips: Full size.
   3. Mirror Trim: 12 inches long.

1.04 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of mirror and mirror mastic.

B. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

C. Sample Warranty: For special warranty.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.06 PRECONSTRUCTION TESTING

A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.
   1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.08 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.09 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
   1. Warranty Period: Five years from date of manufacture.

PART 2 - PRODUCTS

2.01 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C 1503.

B. Annealed Monolithic Glass Mirrors: Mirror Glazing Quality, clear.
   1. Nominal Thickness: 1/4 inch (6.0 mm).

C. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.
   1. Nominal Thickness: 1/4 inch (6.0 mm).

D. Laminated Mirrors: ASTM C 1172, Type II.
   1. Glass for Outer Lite: Annealed float glass, Mirror Glazing Quality, clear.
   2. Nominal Thickness for Outer Lite: 3.0 mm.

3. Glass for Inner Lite: Annealed float glass; ASTM C 1036, Type I (transparent flat glass), Quality-Q3; Class 1 (clear).
4. Nominal Thickness: 3.0 mm.
5. Interlayer: Mirror manufacturer's standard 0.030-inch-thick, clear polyvinyl-butyral interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.

E. Safety Glazing Products: For tempered and laminated mirrors, provide products that comply with 16 CFR 1201, Category II.

2.02 MISCELLANEOUS MATERIALS

A. Sustainable Design Requirements:
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."

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

D. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
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. Franklin International.
b. Laurence, C. R. Co., Inc.
c. Liquid Nails Adhesive.
d. Macco Adhesives.
e. OSI Sealants; Henkel Corporation.
f. Palmer Products Corporation.
g. Pecora Corporation.
h. Royal Adhesives & Sealants.
i. Sommer & Maca Industries, Inc.

2.03 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.

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) Andscot Company, Inc.
   2) Laurence, C. R. Co., Inc.
   3) Stylmark, Inc.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
   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) Andscot Company, Inc.
      2) Laurence, C. R. Co., Inc.
      3) Stylmark, Inc.
3. Finish: Clear bright anodized.

B. Mirror Bottom Clips: Knape & Vogt 277, or approved.

C. Mirror Top Clips: Knape & Vogt 278, or approved.

D. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

E. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.04 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Flat polished.
1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.02 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.03 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
   1. GANA Publications: "Laminated Glazing Reference Manual," "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
   1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
   2. Mirror Clips: Place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges. Locate clips so they are symmetrically placed and evenly spaced.
   3. Install mastic as follows:
      a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
      b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
      c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.04 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

SECTION 08 90 00 - LOUVERS AND VENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes:
   1. Fixed, extruded-aluminum louvers.
   2. Extruded aluminum horizontal screen.
   3. Louver/damper.
   4. Sheet blank off panel.

B. Related Sections:
   1. Division 04 Section "Unit Masonry" for building wall vents (brick vents) into masonry.
   2. Division 05 Section “Metal Fabrications.”
   3. Division 06 Section "Sheathing" for "Flexible Flashing" installed at interior of ductwork and louver joint.
   4. Division 07 Section “Thermal Insulation” for opening perimeter insulation of exterior building envelope penetration sealing.
   5. Division 09 Section "Exterior Painting" for field painting louvers.
   6. Division 23 Sections for louvers that are a part of mechanical equipment.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product Test Reports: Based on tests performed according to AMCA 500-L.

1.04 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to product installation including, but not limited to, the following:
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.
   1. Wind Loads: Determine loads based on pressures as indicated in the Structural Drawings and Notes.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
   1. See Structural General Notes for design earthquake spectral response acceleration, short period (Sds) for Project, and Component Importance Factor.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

2.02 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, G60 zinc coating, mill phosphatized.

D. Fasteners: Use types and sizes to suit unit installation conditions.
   1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
   2. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
   3. For fastening stainless steel, use 300 series stainless-steel fasteners.
   4. For color-finished louvers, use fasteners with heads that match color of louvers.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.03 FABRICATION, GENERAL

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, concealed from view, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

C. Provide sub-sills made of same material as louvers or extended sills for recessed louvers.

2.04 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties, Inc., Model 7” Deep Storm Resistant Fixed Horizontal Louver Model RS-7705 or comparable product by one of the following:
      a. Air Balance Inc.; a Mestek company.
      b. Air Flow Company, Inc.
      c. Airolite Company, LLC (The).
      d. All-Lite Architectural Products.
      e. American Warming and Ventilating, Inc.; a Mestek company.
      f. Arrow United Industries; a division of Mestek, Inc.
      g. Greenheck Fan Corporation.
      h. Industrial Louvers, Inc.
      i. Pottorff, Model ECD-745 Extruded Aluminum Louver.
      j. Reliable Products, Inc.
      k. Ruskin; Air Distribution Technologies, Inc.; Johnson Controls, Inc.
      l. United Enertech Corp.
      m. Or approved.
   2. Louver Depth: See drawing for depths.
   3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch or frames.
   4. Louver Performance Ratings:
      a. Free Area: Not less than 8.0 sq. ft. for 48-inch-wide by 48-inch-high louver.
      b. Air Performance: Intake Pressure drop at 900 fpm free area velocity 0.225 in. H2O. Exhaust pressure drop at 900 fpm free area velocity 0.194 in. H2O.
      c. Wind-Driven Rain Performance: AMCA certified and licensed to bear the AMCA seal. The louver test was based on a 39.370" x 39.370" core area. Unit tested at a rainfall rate of 3.0 inches per hour and with a wind directed to the face of the louver at a velocity 29.1-mph.
   5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.05 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening:
1. Insect Screening: Stainless steel, 18-by-18 mesh, 0.009 inch wire.
2. Bird Screening: Stainless steel, 1/2-inch-square mesh, 0.047-inchwire.

2.06 SHEET BLANK OFF PANEL

A. Provide manufacturer's standard insulated galvanized sheet metal blank off panel with painted finish on outboard (exposed exterior louver face) side. Insulation: Manufacturer's standard 2 inch thick board insulation with a minimum of R-4 per inch. Paint finish on "exterior' surface to match louver color. Wrap all edges and both surfaces of panel in sheet metal. Attach to interior face of louver. See Drawings for locations.

2.07 ALUMINUM FINISHES

A. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

3.02 INSTALLATION OF FLEXIBLE FLASHING AT EXTERIOR LOUVERS DUCTWORK

A. At louver and ductwork joints cover all duct and louver sill and plenums bottoms with peel and stick asphaltic "Flexible Flashing" as specified in Division 06 Section “Sheathing."

B. Apply "flexible flashing" to the internal surfaces of the duct. Flashing to span the entire internal width of duct and return up the sides of the duct 3 inches vertically from bottom.

C. Extend flexible flashing on bottom and sides 2'-6" towards building interior from joint of duct and louver.

D. Flashing to lap over louver/duct joint. Make flashing from single sheet. No seams allowed in any direction.

E. Coordinate this work with Division 23 Heating, Ventilation and Air Conditioning, and Division 06 Section "Sheathing" work.

END OF SECTION

SECTION 09 22 16 - NON STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing members for furring and sound control.

B. Related Sections:
   1. Division 07 Section "Thermal Insulation" for sound insulation.
   2. Division 09 Section “Gypsum Board” for installation of gypsum board.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

1.04 QUALITY ASSURANCE

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.01 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 10 percent.

2.02 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch-diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.1046-inch diameter.

C. Flat Hangers: Steel sheet, in size indicated on Drawings, minimum 1 by 3/16 inch by length indicated.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 54 mils and minimum 1/2-inch-wide flanges.
   1. Depth: 1-1/2 inch.

2.03 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base Metal Thickness: 18 mils (25 gauge).
   2. Depth: 7/8 inch.

B. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch minimum bare-metal thickness of 33 mils (20 gauge) thickness, and depth required to fit insulation thickness detailed.

C. Metal Wall Backing: for fastener backing at wall locations to be clad with wainscot, decorative panels, veneer wall paneling, etc.
   1. Metal Backing Thickness: 33 mils (20 gauge) thickness by width required to provide fasten retention for wall paneling.

2.04 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:
   1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
   2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install bracing at terminations in assemblies.

C. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

D. Isolation: Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations as follows; where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements, and where non-bearing partition and wall framing abuts overhead structure. Provide slip or cushioned type joints as detailed to attain lateral support and avoid axial loading

3.04 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Do not attach hangers to steel roof deck.
   6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.05 INSTALLING FRAMED ASSEMBLIES

A. Direct Furring:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

B. Z-Furring Members:
   1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
   2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
   3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

C. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Interior gypsum board.

B. Related Sections:
   1. Division 04 Section “Cold Formed Metal Framing”
   2. Division 06 Section "Rough Carpentry" for blocking.
   3. Division 07 Section "Thermal Insulation" for insulation installed in assemblies that incorporate gypsum board.
   4. Division 07 Section "Joint Sealants" for joint sealers.
   5. Division 07 Section "Acoustical Joint Sealers" for acoustical joint sealers.
   6. Division 09 Section "Non Structural Metal Framing" for non-structural framing, suspension systems that support gypsum board, and blocking.
   7. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.03 REFERENCE STANDARDS

A. ASTM International (ASTM)
   1. ASTM C 473 - Standard Test Methods for Physical Testing of Gypsum Panel Products
   2. ASTM C 475 - Standard Specification for Joint Compound and Joint Tape for Finishing
   3. ASTM C 514 - Standard Specifications for Nails for the Application of Gypsum Board
   4. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board
   5. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications
   6. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
   7. ASTM C 1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
   8. ASTM C 1178 - Standard Specification for Coated Glass Mat Water Resistant Gypsum Backing Panel
   9. ASTM C 1280 - Standard Specification for Application of Gypsum Sheathing
   10. ASTM C 1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units
   11. ASTM C 1396 - Standard Specification for Gypsum Board
   12. ASTM C 1629 - Standard Classification for Abuse Resistant Nondecorated Interior Gypsum Panel Products and Fiber reinforced Cement Panels
   13. ASTM C 1658 - Standard Specification for Glass Mat Gypsum Panels
   14. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

15. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
16. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials
17. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
18. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials
19. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials
20. ASTM E 695-03 - Standard Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading

B. Gypsum Association (GA)
1. GA-214 - Recommended Levels of Gypsum Board Finish
2. GA-216 - Application and Finishing of Gypsum Panel Products
3. GA-231 - Assessing Water Damage to Gypsum Board
4. GA-238 - Guidelines for the Prevention of Mold Growth on Gypsum Board
5. GA-253 - Application of Gypsum Sheathing
6. GA-801 - Handling and Storage of Gypsum Panel Products: A Guide For Distributors, Retailers, and Contractors

C. The Gypsum Construction Handbook by USG - latest edition.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s current technical literature for each component.

B. Samples: For the following products:
1. Board: Submit sample of each panel product specified, 4 inches x 6 inches.
2. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.

C. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.

D. Manufacturer Instructions: Provide manufacturer’s written installation instructions.

E. Closeout Submittals: Refer to Division 01 Section "Execution and Closeout Requirements."

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum board.

B. Pre-Installation Conference: Schedule meeting, no less than ten (10) days prior to installation of gypsum board; with Owner, Contractor, insulation firestopping /sealant / acoustical/ plaster / drywall installers, mechanical and electrical contractors, and Architect / Acoustical Consultant in attendance.

C. Agenda: Review details of acoustically rated assemblies, such as wall interfacing, expansion joint locations, sealant work, firestopping, sound insulation envelopes, and mechanical / electrical penetrations.

D. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

E. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

F. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Install mockups for the following:
      a. Each level of gypsum board finish indicated for use in exposed locations including.
         1) One wall area with Level Four finish.
         2) One wall area with Level Three finish.
   2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
   3. Simulate finished lighting conditions for review of mockups.
   4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Test any products from non-USA countries to verify that products do not contain asbestos. Submit documentation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic and other causes in accordance with GA-238 and manufacturer recommendations. Stack product flat to prevent sagging. In addition, follow guidelines found in GA-801.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements, GA-216 requirements, or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products intended to stay dry until installation areas are enclosed and conditioned. Products with exposure warranties can be installed per manufacturer recommendations.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.02 GYPSUM BOARD, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.03 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C1396/C1396M.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Certainteed; SAINT-GOBAIN; CertainTeed Type X Gypsum Board or a comparable product by one of the following:
      a. Georgia-Pacific Gypsum LLC.
      b. National Gypsum Company.
      c. PABCO Gypsum.
      d. USG Corporation.
   2. Thickness: 5/8 inch (15.9 mm).
   3. Long Edges: Tapered.

B. Gypsum Ceiling Board: ASTM C1396/C1396M.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Certainteed; SAINT-GOBAIN; CertainTeed Interior Ceiling Gypsum Board or a comparable product by one of the following:
      a. Georgia-Pacific Gypsum LLC.
      b. National Gypsum Company.
      c. PABCO Gypsum.
      d. USG Corporation.
   2. Thickness: 1/2 inch (12.7 mm).
   3. Long Edges: Tapered.

C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Certainteed; SAINT-GOBAIN ; CertainTeed M2Tech Mold and Moisture Resistant Type X Gypsum Board. or a comparable product by one of the following:
      a. Georgia-Pacific Gypsum LLC.
      b. National Gypsum Company.
      c. PABCO Gypsum.
      d. USG Corporation.
   2. Core: 5/8 inch (15.9 mm), Type X.
   3. Long Edges: Tapered.
   4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.04 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Corner bead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.
      g. Curved-Edge Corner-bead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
   1. Basis of Design: Fry Reglet Corp.,
      a. “Z” Reveal Molding; Fry # DRMZ-625-25.
      b. “F” Reveal Molding; Fry # FDM-625-50.
   2. Other Compatible manufacturer:.
      a. Gordon, Inc.
      b. Pittcon Industries.
   3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
   4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.05 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
   3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats. Light Weight joint compounds are not allowed.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.
   5. Moisture-Resistant Gypsum Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.06 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to wood and steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
   2. Recycled Content: Provide blankets with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 10 percent by weight.

E. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings. Install acoustical putty behind electrical outlets and comply with manufacturer's printed recommendations for maintaining full coverage of the outlet box and associated wiring.

J. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: At all locations unless otherwise indicated.
2. Ceiling Type: Ceiling surfaces.
3. Impact Resistant Type: As indicated on Drawings.
4. Moisture- and Mold-Resistant Type: All inside surfaces of exterior walls- Typical.
5. Moisture Resistant Type: Install behind FRP and at exposed wall areas of restrooms and kitchens.

B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum,

from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.04 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.05 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 4: At all panel surfaces that will be exposed to public view and at all concealed locations such as behind casework, chalkboards, whiteboards, tackboards and markerboards.
2. Level 3: In accordance with referenced standard and as follows:
   a. Partial Finishing: Omit third coat and sanding on drywall work in attics, interstitial spaces, and elsewhere as approved by Architect. The two-coat system applied to these areas is required to be smooth and uniform.

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

3.06 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Acoustical panels and exposed suspension systems for ceilings.

B. Related Sections:
   1. Division 09 Section “Non-Structural Metal Framing” for apparatus support assembly penetration at ceiling requiring trim.
   2. Division 11 Section "Audio Visual Equipment" for audio-visual equipment intersecting with ceiling assemblies.
   3. Division 21 "Automatic Fire Suppression Systems" Sections for sprinkler heads penetrating ceiling assemblies.
   4. Division 23 "Heating, Ventilating & Air Conditioning" for HVAC fixtures penetrating ceiling assemblies.
   5. Division 26 "Electrical" for electrical fixtures penetrating ceiling assemblies.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.03 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members.
   2. Method of attaching hangers to building structure.
      a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
   3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
   4. Minimum Drawing Scale: 1/4 inch = 1 foot.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.

E. Seismic Design Submittal: Provide engineered calculations for ceiling system support and seismic restraint calculations and details. Stamp structural calculations by a Structural Engineer licensed in the same state as the project location.

F. Qualification Data: For testing agency.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

H. Maintenance Data: For finishes to include in maintenance manuals.

I. Delegated-Design Submittal: For seismic restraints for ceiling systems.
   1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Build mockup of typical ceiling area as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.08 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Acoustical Ceiling Panels: Provide one box/case of full-size panels of each ceiling type.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design seismic restraints for ceiling systems.

B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

D. Flame-Spread Index: Class A according to ASTM E1264.

E. Smoke-Developed Index: 450 or less.

2.03 ACOUSTICAL PANELS, GENERAL

A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product

designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.04 ACOUSTICAL PANELS (ACT)

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. CertainTeed Corporation; Saint-Gobain North America.
   2. Armstrong World Industries, Inc.
   3. Rockfon (Rockwool International).
   4. USG Corporation.

B. Acoustical Panel Types:
   1. Type ACT1 - Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Corporation; SYMPHONY m High NRC 1220-80-1 or comparable products by one of the available manufacturers.
      a. Classification (ASTM E1264): Type IV, Form 2, Pattern E.
      b. Size: 24 inch by 48 inch by 7/8 inch.
      c. Profile: 15/16 inch square lay-In.
      d. Material: Mineral Fiber.
      e. Recycled Content: 62%.
      f. Fire Performance: Class A (UL).
      g. NRC: 0.80.
      h. CAC: 35
      i. Articulation Class (AC): 190.
      j. Light Reflectance (LR): 90%
      k. Color: White.
      l. Grid: CertainTeed Ceilings 15/16" Exposed Tee, white.
      j. Light Reflectance (LR): 90%
      k. Color: White.
      l. Grid: CertainTeed Ceilings 15/16" Exposed Tee, white.
   2. Type ACT2 - Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Corporation; VINYLROCK 1140-CRF-1 or comparable products by one of the available manufacturers.
      a. Classification Class XX Pattern G per ASTM E1264.
      b. Size: 24" x 48" x 1".
      c. Edge: Square Lay-In 15/16".
      d. Material: Gypsum.
      e. Texture: Smooth.
      f. Acoustics:
         1) CAC: 40.
         2) NRC: 0.
      g. Fire Performance: Class A (UL).
         1) Flame Spread: 25 or less.
         2) Smoke Developed: 50 or less.
      h. Recycled Content: 0%,
      i. Color: White.
      j. Grid: CertainTeed Ceilings 15/16" Exposed Tee, white.
      k. Accessories: Fiberglass Edge Sealant for re-sealing cut edges.

C. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

2.06 EXPOSED TEE GRID SYSTEM

A. Exposed Tee Grid System: CertainTeed Corporation or approved; 15/16-inch for typical room tiles, heavy-duty class and colors selected from color ready, light tones and deep tone selections.

2.07 FLOATING CEILING EDGE

A. Floating Ceiling Edge: Match Grid with 2 “ high trim at perimeter of grid system, with accessory T-bar connection clips in ceiling areas using Uptight Clips, or approved. Allowable edge may exceed two-inches in height, but no more than 3-inches and horizontal leg may be same dimension as vertical.

2.08 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard pure white (off-white not acceptable) factory-applied matte finish for type of system indicated below for other applications and unless otherwise noted.
   1. Metal Grid Colors: White
   2. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
      a. Type: Cast-in-place Postinstalled expansion anchors.
      b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.
      a. Spacing and gauge per IBC, UL and CISCA design.
      b. Supplied and installed by ceilings subcontractor.

E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

J. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

K. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.09 METAL EDGE MOLDINGS AND PERIMETER TRIM

A. Approved Manufacturers:
   1. Basis of Design: CertainTeed Corporation.
   2. Other pre-approved manufacturers meeting the specified requirements, including, but not limited to, the following:
      a. Armstrong
      b. Fry Reglet Corporation.
      c. Rockfon (Rockwool International).
      d. USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
   2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
   3. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; organic coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
      a. Organic Coating: Thermosetting, primer/topcoat system with a minimum dry film thickness of 0.8 to 1.2 mils.

C. Penetration Escutcheon and Trim:
   1. Provide penetration escutcheon(s) for penetration(s) of acoustical panel ceiling panels. Use penetrating material/assembly manufacturer’s standard escutcheon if escutcheon covers penetration hole at perimeter of penetration. Where escutcheon is not provided by penetrating material/assembly manufacturer provide material matching perimeter trim for the exposed dimension and in same color/finish as trim. Where penetration occurs in field of panel provide components allowing for non-visible support of escutcheon that allows removal and reinstallation as required. Provide escutcheons sized for

penetrations in compliance with seismic regulations, if not otherwise indicated in Contract Documents.

2. Provide perimeter trim of acoustical panel ceiling panels where penetrated in panel field or at edges. Use ceiling panels manufacturer's specified trim in color and finish, matching in exposed dimension except those requiring oversized dimension(s). Where penetration occurs in field of panel provide components for non-visible support of trim that allows removal and reinstallation as required. Provide perimeter trim in compliance with seismic regulations, if not otherwise indicated in Contract Documents.

2.10 ACOUSTICAL SEALANT (AS)

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
      b. USG Corporation; SHEETROCK Acoustical Sealant.
      c. Or Approved
   2. Acoustical Sealant for Concealed Joints:
      a. Pecora Corporation; BA-98.
      b. Tremco, Inc.; Tremco Acoustical Sealant.
      c. USG Corporation;

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders. Obtain Architect approval before ceiling grid installation if mechanical or electrical work indicates the need to offset ceiling layout.

3.03 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of four tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors.
   7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 6 inches from ends of each member.
   9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
   3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install penetration escutcheons and trim where acoustical ceiling panels are penetrated. No exposed unfinished edges allowed.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.04 FIELD QUALITY CONTROL

A. Special Inspections: Owner may engage a qualified special inspector to perform the following special inspections and prepare reports:
   1. Suspended ceiling system.
   2. Hangers, anchors and fasteners.

3.05 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl base.
2. Rubber molding accessories.
3. Vinyl molding accessories.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096516 "Resilient Sheet Flooring" for resilient rolled flooring.
3. Section 096519 "Resilient Tile and Plank Flooring" for modular resilient flooring.
4. Section 096543 "Linoleum Flooring" for modular and sheet linoleum flooring.
5. Section 096813 "Tile Carpeting" for modular carpet tile flooring.
6. Section 096816 "Sheet Carpeting" for tufted and woven carpet flooring.
7. Section 104513 "Photoluminescent Egress Path Markings" for luminous stair accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation instructions for each type of substrate.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For resilient base and accessory products, for tests performed by a qualified testing agency.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials from the same production run, to Owner that match products installed and that are packaged with protective covering for

storage and identified with labels describing contents.

1. Furnish not less than 10 linear ft. for every 500 linear ft. or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical products in accordance with ASTM E648 or ASTM E662 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RESILIENT BASE

A. Vinyl Base:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Tarkett USA

2. Classification: ASTM F1861, Type TV (vinyl, thermoplastic), Group I (solid, homogeneous).
3. Style and Location:

   a. Style A, Straight: Provide in areas with carpet.
   b. Style B, Cove: Provide in areas with resilient floor coverings.

4. Minimum Thickness: 0.125 inch.
5. Height: 6 inches.
6. Lengths: Coils in manufacturer's standard length.
7. Outside Corners: Preformed.
8. Inside Corners: Preformed.
9. Colors and Patterns: Moon Rock 29.

2.3 RESILIENT MOLDING ACCESSORIES

A. Rubber Molding Accessories :

1. Accessory Description: cap for cove carpet, cap for cove resilient floor covering, carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, joiner for tile and carpet. transition strips.
2. Profile and Dimensions: As indicated.

B. Vinyl Molding Accessories :

1. Accessory Description: cap for cove carpet, cap for cove resilient floor covering, carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, joiner for tile and carpet. transition strips.
2. Profile and Dimensions: As indicated.

C. Locations: Provide resilient molding accessories in areas indicated.

D. Colors and Patterns: Match Architect's sample.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended in writing by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish, nominal 2 inches wide, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces in accordance with ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative

humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 INSTALLATION OF RESILIENT BASE

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

a. Miter or cope corners to minimize open joints.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.

1. Apply one coat.

E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519 - RESILIENT TILE AND PLANK FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial luxury vinyl floor tiles.
2. Rubber floor tiles.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with resilient tile and plank flooring.
2. Section 096516 "Resilient Sheet Flooring" for resilient rolled flooring.

1.2 DEFINITIONS

A. LVP: Luxury vinyl planks. A marketing term that is applied to modular resilient floor plank products.

B. LVT: Luxury vinyl tiles. A marketing term that is applied to modular resilient floor tile products.

C. VCT: Vinyl composition tiles. A modular resilient floor tile product composed of binder, fillers, and pigments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturers' written data on physical characteristics, durability, and fade resistance.
2. Include manufacturers' written installation instructions for each type of substrate.

B. Shop Drawings: For each type of resilient flooring type required.

1. Include flooring layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples: Full-size units of each color, texture, and pattern of resilient flooring type required.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient flooring product type to include:

1. Methods for maintaining resilient flooring, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to resilient flooring.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials from the same production run to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Resilient Tile and Plank Flooring: Furnish no fewer than 1 box for each 50 boxes or fraction thereof, of each type, color, pattern, and size of resilient flooring product installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient flooring manufacturer for installation techniques required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturers' labels indicating brand name and directions for storing.

B. Store resilient flooring and accessory materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store resilient flooring on flat surfaces.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install resilient flooring until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

B. Do not install resilient flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by resilient flooring manufacturer.

C. Adhesively Applied Products:

1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
2. After post installation period, maintain temperatures within range recommended in writing by manufacturer, but not less than [55 deg F] or more than [95 deg F].
3. Close spaces to traffic during flooring installation.
4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

1.9 WARRANTY

A. Special Warranty for Resilient Flooring Products: Manufacturer agrees to repair or replace components of flooring installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of flooring due to unusual traffic, failure of substrate, vandalism, or abuse.

PART 2 - PRODUCTS

2.1 LUXURY VINYL FLOOR COVERING

A. PROPRIETARY PRODUCT/MANUFACTURER

1. Proprietary Product: Luxury vinyl floor covering with Tarkett’s Techtonic polyurethane comes in tile and plank form. Suitable for commercial working environments and offices:

B. Manufacturer: Tarkett North America Phone: (800) 899-8916

30000 Aurora Rd.

Solon, Ohio 44139

Web: www.tarkett.com

C. Proprietary Product Description:

1. Construction: Tarkett iD Latitude is constructed on a unique composite structure built with homogeneous polymeric calendared layers with a 20 mil PVC wear layer. Techtonic polyurethane coating technology is super tough; resisting scratching, abrasions, scuffing and staining to ensure your floor look nicer, longer.
2. Characteristics:
   (See below for standard embossing, sizing availability, and packaging info)

   • Finish: Techtonic

   • Edge treatment: Square Edge

   • Wearlayer Thickness: .020" (0.5 mm)

   • Overall thickness: 0.120” (3.0 mm)

   • Designs: 22 Wood, 14 Abstract, 8 Stone/Concrete

2.2 PRODUCT PERFORMANCE AND TECHNICAL DATA

A. Tile material – Meets ASTM F1700, Class III, Type B performance standards for solid vinyl floor tile 2.2.

B. Wear layer thickness: 20 mil

C. Residual Indentation (ASTM F1914): Passes

D. Static coefficient of friction (ASTM D2047): ≥ 0.5 SCOF, ADA compliant

E. Static Load Limit (ASTM F970): 250 psi, ≤ 0.005 incheS

F. Dimensional Stability (ASTM F2199): PasseS

G. Resistance to Heat (ASTM F1514): $\Delta\sum \leq 8.0$

D. Resistance to Light: (ASTM F1515): $\Delta\sum \leq 8.0$

E. Chemical Resistance (ASTM F925): Passes

F. Flammability (ASTM E648, CRF): ≥0.45 W/cm² (Class 1)

G. CAN/ULC S102.2: FSV 140 / SDV 445

2.3 INSTALLATION

See iD Latitude Luxury Vinyl Tile and Plank installation

H. instructions for complete details.

3.1. Adhesives:

• Tarkett RollSmart Adhesive:

Coverage: 350 – 400 sq. per gallon

(3/8" Nap Paint Roller used with a paint tray)

• Tarkett 959 Vinyl Tile Adhesive Coverage:

Porous Substrate: 150-175 sq. ft. per gallon

Non-porous: 250-300 sq. ft. per gallon

• Tarkett 959HM High Moisture Substrate Adhesive

Porous Substrate: 125-150 sq. ft. per gallon

Non-porous: 250-300 sq. ft. per gallon

• LVT Rollable

Coverage: 350 – 400 sq. per gallon

(3/8" Nap Paint Roller used with a paint tray)

• Tarkett 975 Two-Part Urethane Adhesive

Porous & Non-Porous Substrate: 225-250 sq. ft. per gallon

• Tarkett 996 Two-Part Epoxy Adhesive

Porous & Non-Porous Substrate: 225-250 sq. ft. per gallon

2.4 AVAILABILITY AND COST

Available through Tarkett retailers nationwide.

2.5 MAINTENANCE

72 Hours after installation is completed, initial maintenance procedures must be implemented in accordance with manufacturer's requirements. Refer to iD Latitude Maintenance Instructions for complete maintenance details.

2.6 TECHNICAL SERVICES

Visit us on the web at www.tarkett.com

Contact Technical support at (800)-899-8916 or Email: Resilient.TechnicalSupport@Tarkett.com

Samples: Submittal samples for verification and approval available upon request from

Tarkett. Samples shall be submitted in compliance with the requirements of the contract documents. Accepted and approved samples shall constitute the standard materials which represent materials installed on the project.

2.7 WARRANTY

Limited 20-year warranty. For complete details, contact Tarkett or an authorized Tarkett distributor.

2.8 RESILIENT TILE FLOORING

A. ROPPE FIESTA RUBBER TILE, manufactured by Roppe Corporation, Fostoria, Ohio. The tile shall conform to ASTM F-1344, Class 1. The tile shall be 3/16" {4.76mm} thick and size (12" x 12". The color shall be R334 LEONADO.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient flooring products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's written installation instructions to ensure adhesion of flooring.

B. Concrete Substrates: Prepare in accordance with ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient flooring manufacturer. Do not use solvents.
3. Alkalinity Testing: Perform pH testing in accordance with ASTM F710. Proceed

with installation only if pH readings are not less than [7.0] and not greater than [8.5].

4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75] percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.

1. Do not install flooring until it is the same temperature as space where it is to be installed.

E. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION OF RESILIENT TILE AND PLANK FLOORING

A. Comply with manufacturer's written installation instructions.

B. Discard broken, cracked, chipped, or deformed tiles.

C. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

D. Tile Matching: Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered.

1. Lay tiles with grain running in one direction

E. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

F. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

H. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

I. Adhered Floor Tile: Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written installation instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times, to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

J. Floating Floor Tile: Install LVT floor tiles in accordance with flooring manufacturer's written installation instructions.

K. Seamless Installation: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

L. Resilient Terrazzo Accessories: Install in accordance with manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting flooring.

B. Perform the following operations immediately after completing flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.

1. Apply one coat.

E. Cover resilient flooring until Substantial Completion.

END OF SECTION

SECTION 096536 - STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Static-control, vinyl composition floor tile.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with static-control resilient flooring.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

C. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.
2. Show locations of inscribed maintenance floor tiles in conductive, solid vinyl floor tile installation areas.
3. Show grounding locations of grounding strips and connections.

D. Samples: For each type of static-control resilient flooring and in each color, pattern, and texture required, in manufacturer's standard size, but not less than **6 by 9 inches**.

E. Samples for Initial Selection: For each exposed static-control resilient flooring product, in manufacturer's standard size.

F. Samples for Verification: For each type of static-control resilient flooring and in each color, pattern, and texture required, of size indicated below:

1. Floor Tile: **Full-size** units.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every [**50**] boxes, or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required for specified products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended in writing by manufacturer, but not less than 50 deg F or more than 90 deg F.

1. Floor Tile: Store on flat surfaces.
2. Sheet Floor Covering: Store rolls upright.

1.8 PROJECT CONDITIONS

A. Maintain ambient temperatures in spaces to receive static-control resilient flooring within range recommended by manufacturer, but not less than [70 deg F] or more than [85 deg F], during the following time periods:

1. Period recommended in writing by manufacturer before installation.

2. During installation.
3. Period recommended in writing by manufacturer after installation.

B. Until Substantial Completion, maintain ambient temperatures in installation areas within range recommended by manufacturer, but not less than [55 deg F] or more than [95 deg F].

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for period recommended in writing by manufacturer after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 SUMMARY

Section Includes:

Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

Related Documents

Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.

Specifier Note: Revise paragraph below to suit project requirements. Add section numbers and titles per CSI MasterFormat and specifier's practice.

Related Sections:

Other Division 9 sections for floor finishes related to this section but not the work of this section

Division 3 Concrete; not the work of this section

Division 6 Wood and Plastics; not the work of this section

Division 7 Thermal and Moisture Protection; not the work of this section

2.02 REFERENCES

Armstrong Flooring Technical Manuals

Armstrong Flooring Guaranteed Installation Systems instructions.

ASTM International:

ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials

ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

ASTM F 1066 Standard Specification for Vinyl Composition Tile

ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring

ASTM F 1861 Standard Specification for Resilient Wall Base

ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

National Fire Protection Association (NFPA):

NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant

Heat Energy Source

NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials

Canadian Standards

CAN/ULC-S102.2 Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies

ANSI/ESD Standards

ANSI/ESD STM 7.1 :Floor Materials—Resistive Characterization of Materials

ANSI/ESD STM 97.1: Floor Materials and Footwear—Resistance in Combination with a Person

ANSI/ESD STM 97.2: Floor Materials and Footwear Voltage Measurement in Combination with a Person

2.03 SYSTEM DESCRIPTION

Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.

Administrative Requirements

Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

Pre-installation Testing: Conduct pre-installation testing as follows: [Specify testing (i.e. moisture tests, bond test, pH test, etc)

Specifier Note: Retain paragraph below for erected assemblies (either on-site or off-site) required for review of construction, coordination of work of several sections, testing, or observation of operation. Mock-ups, when accepted or approved, establish standards by which work will be judged. Coordinate below with Division 1 Quality Control (Mock-Up Requirements) Section

Test Installations/ Mock-ups: Install at the project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.

Specifier Note: Contact an Armstrong Flooring Sales Representative for more information about test installations.

Mock-Up Size: [Specify mock-up size.]

Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.

Incorporation: Mock-up may be incorporated into the final construction with Owner's approval.

Sequencing and Scheduling

Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.

Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

Specifier Note: Some products may be installed using an Armstrong high moisture adhesive.

2.04 SUBMITTALS

Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.

Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.

Specifier Note: Order product samples and access technical documents, including installation instructions, product specification sheets, SDS and more at www.armstrongflooring.com/commercial.

Submit Safety Data Sheets (SDS) available for adhesives, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.

If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

Closeout Submittals: Submit the following:

Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

Warranty: Warranty documents specified herein

2.05 QUALITY ASSURANCE

Single-Source Responsibility: provide types of flooring and accessories supplied by one manufacturer, including moisture mitigation systems, primers, leveling and patching compounds, and adhesives.

Select an installer who is experienced and competent in the installation of Armstrong resilient vinyl composition tile flooring and the use of Armstrong Flooring subfloor preparation products.

Engage installers certified as Armstrong Commercial Flooring Certified Installers

Confirm installer's certification by requesting their credentials

Fire Performance Characteristics: Provide resilient vinyl composition tile flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory or other testing agency acceptable to authorities having jurisdiction:

ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I

ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less

CAN/ULC-S102.2 – Flame Spread Rating and Smoke Developed – Results as tested.

Specifier Note: Download the latest Fire and Smoke reports at www.armstrongflooring.com/commercial

2.06 DELIVERY, STORAGE AND HANDLING

Comply with Division 1 Product Requirements Sections

Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.

Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

2.07 PROJECT CONDITIONS

Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF (18ºC) and a maximum temperature of 85ºF (29ºC) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, the temperature should never rise above 100°F (38°C) nor fall below 55°F (13°C). The performance of the flooring material and adhesives can be adversely affected outside this temperature range. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances. Refer to product installation recommendations for a complete guide on project conditions.

2.08 LIMITED WARRANTY

A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

Limited Warranty Period: 5 years

Limited Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

For the Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

Specifier Note: To deliver your client the best customer experience, register the product and installation with the Product Registration service provided at www.armstrongflooring.com/commercial .

2.09 EXTENDED SYSTEM LIMITED WARRANTY

Resilient Flooring System: Submit a written warranty executed by the manufacturer, agreeing to repair or replace system (subfloor preparation products, adhesive, and floor covering) that fails within the warranty period.

Limited Warranty Period: 10 years on top of the Resilient Flooring Limited Warranty

[S-463 Level Strong™ cement based self-leveling compound] [S-466 Patch Strong™ flexible patching and smoothing compound] [S-464 Prime Strong™ acrylic primer for porous substrates] [S-465 NP Prime Strong™ epoxy primer for non-porous substrates] [S-462 Seal Strong™ two part moisture mitigation system]

The installation of an Armstrong Flooring product along with the recommended Armstrong Flooring adhesive, as well as any one of the Strong System subfloor preparation products listed above, provides 10 additional years of limited warranty coverage. The Strong System limited warranty covers the installation integrity for the length of the flooring product warranty plus 10 years. In order to qualify for the Strong System Warranty, any subfloor preparation product needed for an installation must be an Armstrong Flooring product.

For the System Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

When Armstrong Flooring Strong System subfloor preparation products are used with other manufacturers' floor coverings, adhesives, or other subfloor preparation products, Armstrong Flooring warrants our products to be free from manufacturing defects from the date of purchase through the limited warranty period of 15 years.

2.10 MAINTENANCE

Extra Materials: Deliver extra materials to Owner. Furnish extra materials from same production run as products installed. Packaged with protective covering for storage and identified with appropriate labels.

Specifier Note: Revise paragraph below specifying size and percentage as required for project.

Quantity: Furnish quantity of flooring units equal to [5] % of amount installed.

Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra material.

2.11 MANUFACTURER

A. Resilient tile flooring, wall base, adhesives and subfloor preparation products and accessories:

Armstrong Flooring Inc., 1770 Hempstead Road, Lancaster, PA 17605, www.armstrongflooring.com/commercial

Manufacturer must have a headquarters in the United States of America

Specifier Note: Retain article below for proprietary method specification. Add product attributes, performance characteristics, material standards and descriptions as applicable. Use of such phrases as “or equal” or “or approved equal” or similar phrases may cause ambiguity in specifications. Such phrases require verification (procedural, legal and regulatory) and assignment of responsibility for determining "or equal" products.

2.12 RESILIENT TILE FLOORING MATERIALS

Specifier Note: For a product specification snapshot which includes product structures, packaging information and color choices, visit www.armstrongflooring.com/commercial

Provide Excelon SDT™ Static Dissipative Tile manufactured by Armstrong Flooring, Inc.

Description: Static dissipative vinyl tile composed of polyvinyl chloride resin, plasticizers, fillers, pigments, and antistatic additive with colors and texture dispersed uniformly throughout its thickness.

Tile shall meet size, thickness, indentation, impact, deflection, dimensional stability, resistance to chemicals, squareness, and resistance to heat requirements of ASTM F 1066 Standard Specification for Vinyl Composition Tile, Class 2, through pattern.

Pattern and Color: in [%COLOR%] [color selected from the range currently available from Armstrong Flooring, Inc.]

Size: 12 in. x 12 in.

Thickness: 1/8"/0.125 in. (3.2mm)

2.13 PRODUCT SUBSTITUTION

Substitutions: No substitutions permitted because of the specific attributes listed in Section 2.02.

Specifier Note: Add article below for alternates required for the project, state work covered. Coordinate with other sections, as needed.

2.14 WALL BASE MATERIALS

For top set wall base: [Provide 1/8 in. (3.18 mm) thick, 4 in. (10.16 cm) high Armstrong Flooring Color-Integrated Wall Base with a matte finish, conforming to ASTM F 1861, Type TP - Rubber, Thermoplastic, Group 1 - Solid, Style B – Cove.] [Provide 1/4 in. (6.35 mm) thick, 4.5 in. (11.43 cm) high Armstrong Flooring Color-Integrated Wall Base with a matte finish, conforming to ASTM F 1861, Type TP - Rubber, Thermoplastic, Group 1 - Solid, Style A – Straight.]

2.15 ADHESIVES

Provide Armstrong S-202 Static Dissipative Tile Adhesive with 2 in. (5.08 cm) wide x 24 in. (60.96 cm) long copper ground-connection strips for under the tile and Armstrong S-725 Wall Base Adhesive at the wall base as recommended by the flooring manufacturer.

2.16 ACCESSORIES

Provide Armstrong S-392 Static Dissipative Tile Polish for application as initial and on-going static dissipative maintenance finish.

For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide Armstrong [S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive] [S-463 Level Strong™ cement based self-leveling compound] [S-466 Patch Strong™ patching and smoothing compound].

[For priming porous substrates to aid in adhesive bond strength and reducing subfloor porosity, provide S-464 Prime Strong™ acrylic primer for porous substrates. For non-porous substrates, provide S-465 NP Prime Strong™ epoxy primer for non-porous substrates].

[For creating a moisture barrier, provide S-462 Seal Strong™ two part moisture mitigation system].

For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.

Provide transition/reducing strips tapered to meet abutting materials.

Provide threshold of thickness and width as shown on the drawings.

Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.

Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

PART 3 - EXECUTION

MANUFACTURER’S INSTRUCTIONS

A. Compliance: Comply with manufacturer’s product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

3.02 EXAMINATION

Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test, etc.).

Visually inspect flooring materials, adhesives and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.

Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.03 PREPARATION

[Subfloor Preparation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with Armstrong Flooring [S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive] [S-463 Level Strong™ cement based self-leveling compound] [S-466 Patch Strong™ patching and smoothing compound] [S-464 Prime Strong™ acrylic primer for porous substrates] [S-465 Prime Strong™ epoxy primer for non-porous substrates] as recommended by the flooring manufacturer. Refer to Armstrong Flooring Guaranteed Installation Systems and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.]

[Subfloor Preparation Moisture Mitigation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, mitigate moisture and other defects with Armstrong Flooring [S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive] [S-463 Level Strong™ cement based self-leveling compound] [S-466 Patch Strong™ patching and smoothing compound] [S-462 Seal Strong™ two part moisture mitigation system] [S-464 Prime Strong™ acrylic primer for porous substrates] [S-465 Prime Strong™ epoxy primer for non-porous substrates] as recommended by the flooring manufacturer. Refer to

Armstrong Flooring Guaranteed Installation Systems and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.]

Subfloor Cleaning: The surface shall be free of dust, solvents, varnish, paint, wax, oil, grease, sealers, release agents, curing compounds, residual adhesive, adhesive removers and other foreign materials that might affect the adhesion of resilient flooring to the concrete or cause a discoloration of the flooring from below. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents. Spray paints, permanent markers and other indelible ink markers must not be used to write on the back of the flooring material or used to mark the concrete slab as they could bleed through, telegraphing up to the surface and permanently staining the flooring material. If these contaminants are present on the substrate they must be mechanically removed prior to the installation of the flooring material.. Refer to the Armstrong Flooring Guaranteed Installation Systems and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.

Perform subfloor moisture testing in accordance with [ASTM F 2170, “Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes”][ASTM F 1869,Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride] and Bond Tests as described in the Armstrong Flooring Guaranteed Installation Systems, to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. [Relative humidity shall not exceed 75%.][MVER shall not exceed 3 lbs./1000 sq. ft./24 hrs.] On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.

Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.

Wood subfloors: Armstrong resilient floors are recommended on suspended wood subfloors with a 1/4" underlayment (see product installation systems for exceptions) and a minimum of 18" of well-ventilated air space below. Armstrong Flooring does not recommend installing resilient flooring on wood subfloors applied directly over concrete or on sleeper-construction subfloors. Loading requirements for subfloors are normally set by various building codes on both local and national levels. Trade associations such as APA–The Engineered Wood Association provide structural guidelines for meeting various code requirements. Subfloor panels are commonly marked with span ratings showing the maximum center-to-center spacing in inches of supports over which the panels should be placed.

Refer to the Armstrong Flooring Guaranteed Installation Systems and ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring for additional information.3

Wood subfloors - Surface Cleaning: Make subfloor free from dust, dirt, grease, and all foreign materials.

Check panels for sources of discoloration such as contamination from paint, varnish, stain overspray or spills, plumbing sealers, asphalt, heater fuel, markers or potential staining agents such as wood or bark not visible on the surface, edge sealers, logo markings, printed nail patterns and synthetic patches.

Remove old adhesive.

Cover adhesive, oil or wax residue with an appropriate underlayment. If the residue is tacky, place a layer of felt or polyethylene sheeting over it to prevent a cracking sound when walking on the floor.

Remove all paint, varnish, oil and wax from all subfloors. Many buildings constructed before 1978 contain lead-based paint, which can pose a health hazard if not handled properly. State and federal regulations govern activities that disturb lead-based painted surfaces and may also require notice to building occupants. Do not remove or sand lead-based paint without consulting a qualified lead professional for guidance on lead-based paint testing and safety precautions. Armstrong Flooring does not recommend the use of solvents to remove paint, varnish, oil, wax or old adhesive residues because the solvents can remain in the subfloor and negatively affect the new installation. Whenever sanding, be certain the work site is well ventilated and avoid breathing dust. If high dust levels are anticipated, use appropriate National Institute for Occupational Safety and Health (NIOSH) designated dust respirator. All power sanding tools must be equipped with dust collectors. Avoid contact with skin or eyes. Wear gloves, eye protection and long-sleeve, loose fitting clothes

For additional information on the installation and preparation of wood and board-type underlayments see the current edition of ASTM F1482, “Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring.”

Vacuum or broom-clean surfaces to be covered immediately before the application of flooring.

3.04 INSTALLATION OF FLOORING

Install flooring in strict accordance with the latest edition of Armstrong Flooring Guaranteed Installation Systems. Failure to comply may result in voiding the manufacturer’s warranty listed in Section 1.08.

Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.

If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern

within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.

Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.

Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.05 INSTALLATION OF ACCESSORIES

Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.

Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.

Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

Apply [butt-type] [overlap] metal edge strips where shown on the drawings, [before] [after] flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.06 CLEANING

Specifier Note: Information can be obtained by visiting www.armstrongflooring.com/commercial .

Perform initial and on-going maintenance according to the latest edition of the maintenance recommendations for Static Dissipative Tile.

3.07 PROTECTION

Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Carpet tile.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories", Section 096519 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.
3. Section 096816 "Sheet Carpeting" for carpet roll goods.

1.2 PREINSTALLATION MEETINGS

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.

7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples for Verification: Actual sample of finished products for each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: **12-inch-** long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

B. Qualification Statements: For Installer.

C. Sample Warranties: For carpet tile.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to [**5**] percent of amount installed for each type indicated, but no fewer than 10 full-size units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is certified by the

International Certified Floorcovering Installers Association at the **Commercial II** certification level.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.9 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
b. Loss of tuft-bind strength.
c. Excess static discharge.
d. Delamination.
e. Dimensional instability.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Manufacturers: Subject to compliance with requirements, provide products by the

following:

1. Tarkett USA

B. Color: PIGMENTED SEPIA 65410.

C. Pattern: SKY ATLAS 11661.

D. Pile Characteristic: Level-loop pile.

E. Yarn Twist: 128 TPI.

F. Density: 5,707 oz./cu. yd..

G. Pile Thickness: 0.082 for finished carpet tile[in accordance with ASTM D6859].

H. Stitches: 10.0 stitches per inch.

I. Gage: 5/6.

J. Total Weight: 90.9 oz./sq. yd. for finished carpet tile.

K. Primary Backing/Backcoating: Manufacturer's standard composite materials

L. Secondary Backing: Manufacturer's standard material

M. Size: 18 by 36 inches.

N. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:

a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended in writing by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive types to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and that are recommended in writing by carpet tile manufacturer for releasable installation.

C. Metal Edge/Transition Strips: Extruded aluminum with **mill** finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft.] in 24 hours.
    b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
    c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Wood Subfloors: Verify the following:

1. Underlayment over subfloor complies with requirements specified in Section 061600 "Sheathing."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. Metal Subfloors: Verify the following:

1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

F. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer. Verify the following:

1. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch, protrusions more than 1/32 inch, and substances that may interfere with adhesive bond or show through surface.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, in accordance with manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended in writing by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended in writing by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 09 69 00 - ACCESS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cementitious-core steel panel access flooring.
2. Access-floor coverings.
3. Accessories.

1.2 DEFINITIONS

A. ESD: Electrostatic discharge. The transfer of electric charge between bodies at different potentials, from panel surface to raised access-floor substructure.

B. UFAD: Underfloor air distribution.

1.3 COORDINATION

A. Coordinate locations, layout, and installation of electrical and mechanical work in underfloor cavity to prevent interference with access flooring.

1. Mark pedestal locations on subfloor to enable mechanical and electrical work to proceed without interfering with access-flooring pedestals installed after mechanical and electrical work.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
b. Include loading capacities.

B. Shop Drawings:

1. Layout of access flooring and relationship to adjoining Work based on field-verified dimensions.
2. Details and sections with descriptive notes indicating materials, finishes,

fasteners, typical and special edge conditions, accessories, and understructures.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of access flooring.

B. Product Test Reports: For each type of access-flooring panel material and floor covering, for tests performed by a qualified testing agency.

C. Preconstruction Test Reports: For preconstruction adhesive field test.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Panels: 5%
2. Gratings: 5%
3. Pedestals: 5%
4. Stringers: 5%

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install access flooring until spaces are enclosed, subfloor has been sealed, ambient temperature is between 50 and 90 deg F, and relative humidity is not less than 20 and not more than 70 percent.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain products from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide access flooring capable of complying with the following performance requirements in accordance with testing procedures in CISCA's "Recommended Test Procedures for Access Floors":

1. Concentrated Loads: 1000 lbf with the following deflection and permanent set:
2. Ultimate Loads: 2000 lbf.
3. Rolling Loads: With local or overall deformation not to exceed 0.040 inch.

a. CISCA Wheel 1: 10 passes at 800 lbf.
b. CISCA Wheel 2: 10,000 passes at 600 lbf.

4. Pedestal-Overturning-Moment Test: 1000 lbf x inches.
5. Drop Impact Load Test: 150 lb.

B. Fire Performance:

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.

2.3 CEMENTITIOUS-CORE STEEL PANEL ACCESS FLOORING

A. Provide panels fabricated from cold-rolled steel sheet, with die-cut flat top sheet and die-formed and stiffened bottom pan welded together. Protect metal surfaces against corrosion using manufacturer's standard factory-applied finish. Completely fill internal spaces of completed units with manufacturer's standard cementitious material.

B. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Tate Access Floors, Inc

C. Configuration: Provide modular panels with nominal size of 24 by 24 inches, interchangeable with other field panels without disturbing adjacent panels or understructure.

D. Attachment to Understructure: Bolted.

2.4 ACCESS-FLOOR COVERINGS

A. Carpet Tile: Manufacturer's standard tufted, modular carpet tile product.

1. Electrostatic Propensity: Less than 3.5 kV when tested in accordance with AATCC 134.
2. Color, Texture, and Pattern: As indicated by manufacturer's designations.

2.5 FABRICATION

A. Fabrication Tolerances:

1. Panel Size: Plus or minus 0.020 inch of required size.
2. Squareness: Plus or minus 0.015 inch between diagonal measurements across top of panel.
3. Flatness: Plus or minus 0.035 inch, measured on a diagonal on top of panel.

B. Panel Markings: Clearly and permanently mark floor panels on their underside with panel type and concentrated-load rating.

C. Bolted Panels: Provide panels with holes drilled in corners to align precisely with threaded holes in pedestal heads and to accept countersunk screws with heads flush with top of panel.

1. Captive Fasteners: Provide fasteners held captive to panels.

D. Cutouts: Fabricate cutouts in floor panels for cable penetrations and service outlets. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with structural performance requirements.

1. Number, Size, Shape, and Location: As indicated on Drawings.
2. Grommets: Where indicated, fit cutouts with manufacturer's standard grommets; or, if size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding with tapered top flange. Furnish removable covers for grommets.
3. Provide foam-rubber pads for sealing annular space formed in cutouts by cables.

2.6 ACCESSORIES

A. Pedestal System Understructure: System consisting of base, column with provisions for height adjustment, and head (cap); made of steel.

1. Base: Square or circular base with not less than 16 sq. in. of bearing area.
2. Column: Of height required to bring finished floor to elevations indicated. Weld column to base plate.
3. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than 2 inches and for locking at a

selected height, so deliberate action is required to change height setting and prevent vibratory displacement.

4. Head: Designed to support the floor panel indicated.

    a. Bolted Assemblies: Provide head with four holes aligned with holes in floor panels for bolting of panels to pedestals.

B. Stringer System Understructure: Modular stringer systems designed to bolt to pedestal heads and form a grid pattern. Protect steel components with manufacturer's standard galvanized or corrosion-resistant paint finish.

    1. Continuous Gaskets: At contact surfaces between panel and stringers to deaden sound, seal off the underfloor cavity from above, and maintain panel alignment and position.

C. Post-Installed Anchors: For anchoring pedestal bases to subfloor, provide four post-installed expansion anchors made from carbon steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5 (5 microns) for Class SC 1 (Mild), with the capability to sustain, without failure, a load equal to 1.5 times the loads imposed by pedestal-overturning moment on fasteners, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

D. Service Outlets: Standard UL-listed and -labeled assemblies, for recessed mounting flush with top of floor panels; for power, communication, and signal services; and complying with the following requirements:

    1. Structural Performance: Cover capable of supporting a 800 lbf concentrated load.
    2. Cover and Box Type: Hinged polycarbonate cover with opening for passage of cables when cover is closed and including frame and steel box or formed-steel plate for mounting electrical receptacles.
    3. Location: In center of panel quadrant unless otherwise indicated.
    4. Receptacles and Wiring:

        a. Electrical receptacles and wiring for service outlets are specified elsewhere.

            1) Factory Wired: For field hardwiring with armored cable, containing three insulated 12 AWG solid-copper conductors, terminated with a 6-inch- long pigtail.

E. Panel Lifting Device: Panel manufacturer's standard portable lifting device for each type of panel required.

F. Perimeter Support: Where indicated, provide manufacturer's standard method for supporting panel edge and forming transition between access flooring and adjoining floor coverings at same level as access flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer and manufacturer's authorized representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of conditions and deleterious substances that might interfere with attachment of pedestals.
2. Verify that concrete floor sealer and finish have been applied and cured.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out floor panel installation to keep the number of cut panels at floor perimeter to a minimum. Avoid using panels cut to less than 6 inches.

B. Locate each pedestal, complete any necessary subfloor preparation, and vacuum subfloor to remove dust, dirt, and construction debris before beginning installation.

3.3 INSTALLATION

A. Install access flooring and accessories under supervision of access-flooring manufacturer's authorized representative to produce a rigid, firm installation that complies with performance requirements and is free of instability, rocking, rattles, and squeaks.

B. Mechanical Attachment of Pedestals: Attach pedestals to subfloor with post-installed mechanical anchors in accordance with access-flooring manufacturer's written instructions.

C. Adjust pedestals so installed panels are flat, level, and at the proper height.

D. Stringer Systems: Secure stringers to pedestal heads in accordance with access-flooring manufacturer's written instructions.

E. Install flooring panels securely in place, leaving them properly seated with panel edges flush. Do not force panels into place.

F. Scribe perimeter panels to provide a close fit, with adjoining construction having no voids greater than 1/8 inch where panels abut vertical surfaces.

1. To prevent dusting, seal cut edges of steel-encapsulated, wood-core panels with

sealer recommended in writing by access-flooring manufacturer.

G. Cut and trim access flooring and perform other dirt-or-debris-producing activities at a remote location or as required to prevent contamination of subfloor under installed access flooring.

H. Grounded Access Flooring: Ground in accordance with access-flooring manufacturer's written instructions and as needed to comply with performance requirements for electrical resistance of floor coverings.

1. Panel-to-Understructure Resistance: Not more than 10 ohms as measured without floor coverings.

I. Underfloor Dividers: Scribe and install underfloor-cavity dividers to closely fit against subfloor surfaces, and seal with mastic.

J. Closures: Scribe closures to closely fit against subfloor and adjacent finished-floor surfaces. Set in mastic and seal to maintain plenum effect within underfloor cavity.

K. Clean dust, dirt, and construction debris caused by floor installation, and vacuum subfloor area as installation of floor panels proceeds.

L. Install access flooring without change in elevation between adjacent panels and within the following tolerances:

1. Plus or minus 1/8 inch in any 10 ft. distance.
2. Plus or minus 1/4 inch from a level plane over entire access-flooring area.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect access-flooring components, assemblies, and equipment installations, including connections.

B. Prepare test and inspection reports.

3.5 PROTECTION

A. Prohibit traffic on access flooring for 24 hours and removal of floor panels for 72 hours after installation, to allow pedestal adhesive to set.

B. Replace access-flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

3.6 DEMONSTRATION AND TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain access flooring.

B. Schedule demonstration and training session within 60 to 90 days after date of Substantial Completion.

END OF SECTION

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Surface preparation and the application of paint systems on the following exterior substrates:
      a. Steel.

B. Related Sections:
   1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
   2. Division 07 Section “Water Repellents” for water repellent coatings.
   3. Division 08 Sections for factory priming hollow metal doors and frames with primers specified in this Section.
   4. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
   5. Division 09 Section "High-Performance Coatings" for coating systems applied to exposed structural steel, decorative metal railings and metal canopies.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. VOC content.

1.04 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. Paint: 2 percent, but not less than 1 gal. of each material and color applied.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.06 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.07 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.08 WARRANTY

A. Warranty Period: two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
   1. Benjamin Moore & Co.
   2. Kelly-Moore Paint Company.
   3. Miller Paint Co.
   4. PPG Paints.
   5. Rodda Paint Co.
   6. Rust-Oleum Corporation.
   7. Sherwin-Williams Company (The).
   8. Tnemec.

2.02 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

C. Colors: As indicated in Finish Schedule on Drawings, or, if not indicated, as selected by Architect.

2.03 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions.
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
   3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
   4. Paint entire exposed surface of window frames and sashes.
   5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. Unless otherwise approved by the Architect, apply a minimum of four coats of paint where deep or bright colors are used to achieve satisfactory results.

D. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

E. Sand and dust between each coat to provide an anchor for next coat, and to remove defects visible from a distance up to 39”

F. Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer’s directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.

G. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

B. Painted exterior and interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are found by the Architect:
   1. Brush/roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
   2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
   3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
   4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
   5. Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).

C. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces:
   1. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
   2. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
   3. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
   4. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.

D. Painted surfaces rejected by the inspector or Architect shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates: High Traffic: doors and frames, and high exposure: ~~metal entry canopies~~.
   1. Alkyd System: MPI EXT 5.1T.
      a. Prime Coat: Primer, S-W Pro Industrial Pro-Cryl Universal Primer, base compatible with topcoat color.
      b. Intermediate Coat: Polyurethane, to match topcoat.
      c. Topcoat: Polyurethane, S-W Pro Industrial Urethane Alkyd Enamel, semi-gloss.

END OF SECTION

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation of interior substrates and application of the following:

1. Primers.
2. Water-based finish coatings.
3. Solvent-based finish coatings.
4. Floor sealers and paints.
5. Dry fall coatings.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming structural steel substrates.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 099113 "Exterior Painting."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples: For each type of topcoat product.

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of paint system and each color and gloss of topcoat. Submit actual paint drawdowns as specified below for verification Samples.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in applicable interior painting schedule articles to cross-reference paint systems specified in this Section. Include color designations.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match paint products applied and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.4 DELIVERY, STORAGE, AND HANDLING

A. containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

1.6 FIELD MOCK UP

A. Before proceeding with Contract Work, apply where directed each specified Coating on actual Work Surfaces.

B. Include at least the following:

1. Walls: 100 sq. ft.
2. Ceilings: 100 sq. ft.
3. Doors and Door Frames: 1
4. Cabinets: 1

C. Simulate contract lighting during architect’s review.

D. Prior to starting Project Work, adjust Mock-Up Colors as directed by Architect at no additional cost to Owner.

E. Accepted Mock Up represents Minimum Acceptance Standard for Subsequent Work.

F. Accepted Mock Up, in like-new condition, may be used in Contract Work.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each paint product from single source from single manufacturer.

2.2 INTERIOR PAINTS, GENERAL

A. Interior Paints: Subject to compliance with requirements, provide product listed in product types below and applicable interior painting schedule articles for the paint category indicated.

B. Material Compatibility:

1. Materials for use within each paint system must be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.

C. Colors:

1. A. See Color Schedule on Drawings.
2. Manufacturers listed in Approved Products List are approved provided they can supply
3. Colors that match selected Colors to Architect's satisfaction.
4. Most Colors will be to match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Cementitious Composition Board: 12 percent.
3. Masonry (Clay and CMU): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent. Verify that finishing compound is dry and sanded smooth.

6. Plaster: 12 percent. Verify that plaster is fully cured.

C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints to be painted exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove loose rust, loose mill scale, loose shop primer, and other loose foreign matter. Clean using methods recommended in writing by paint manufacturer:

1. SSPC-SP 11.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for interior use in paint system indicated.
2. Sand surfaces that will be exposed to view and remove sanding dust.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Canvas and Cotton Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

L. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION OF INTERIOR PAINT PRODUCTS

A. Apply paints in accordance with manufacturer's written instructions.

1. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
2. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
3. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
4. Primers specified in the applicable interior painting schedule articles may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.

c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.

1. Touch up and restore painted surfaces damaged by testing.
2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.
3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 PAINTING SCHEDULE

A. General

a. Prime Coats specified below may be omitted where Factory-applied Shop Coatings have been applied by other Trades.
b. 2. Prime Coats specified below may be omitted from Existing Finished Surfaces, provided Existing Coating is sound.
c. Quantities of Coats specified below are minimum. Finished Work shall be even, uniform, and free from cloudy and mottled appearance. Apply additional Coats (minimum) of any Deep or Bright Tone Colors where necessary to hide Substrate.

B. Minimum Dry Film Thicknesses specified below include Prime Coat and Finish Coats combined.

C. Note: Sheen identified below to be verified with Finish Schedule requirements on Drawings.

D. Exterior Aluminum: & Stainless Steel:

1. Latex Enamel

a. 1 coat Galvanized Primer (MPI Product #134 - Min. Solids Volume 38% & Max. VOC 100 grams/liter), followed by:
b. 2 coats Semi-gloss (MPI Level #5) Latex Enamel (MPI Product #11 - Min. Solids Volume 39% & Max. VOC 50 grams/liter)
c. Minimum Total Dry Film Thickness: 4.0 mils

E. Exterior Galvanized Steel:

1. Latex Enamel

a. 1 coat Galvanized Primer, (MPI Product #134 - Min. Solids Volume 38% & Max. VOC 100 grams/liter), followed by:
b. 2 coats Semi-gloss (MPI Level #5) Latex Enamel (MPI Product #11 - Min. Solids Volume 39% & Max. VOC 50 grams/liter)
c. Minimum Total Dry Film Thickness: 4.0 mils

F. Exterior Steel Handrails:

1. Polyurethane Enamel

a. 1 coat Epoxy Coating (MPI Product #98 - Min. Solids Volume 45% & Max. VOC 250 grams/liter), followed by:
b. 2 coats High Gloss (MPI Level #7) Polyurethane Enamel (MPI Product #72 - Min. Solids Volume 64% & Max. VOC 250 grams/liter)
c. Minimum Total Dry Film Thicknesses: 5.0 mils

G. All Other Exterior Ferrous Metal:

1. Latex Enamel

a. 1 coat Bonding Primer (MPI Product #107 - Min. Solids Volume 38% & Max. VOC 100 grams/liter), followed by:
b. 2 coats Semi-gloss (MPI Level #5) Latex Enamel (MPI Product #11 - Min. Solids Volume 39% & Max. VOC 50 grams/liter)
c. Minimum Total Dry Film Thickness: 4.0 mils

H. Exterior Woodwork:

1) Stain

a) 2 coats Penetrating Oil Stain (MPI Product #13) Stain & Varnish
b) 1 coat Penetrating Oil Stain (MPI Product #13), followed by:
c) 1 coat Clear Sanding Sealer (MPI Product #91), followed by:
d) 3 coats High-gloss (MPI Level #7) Varnish (MPI Product #29)

2) Alkyd Enamel

a) 1 coat Exterior Alkyd Primer (MPI Product #5 - Min. Solids Volume 75% & Max. VOC 200 grams/liter), followed by:
b) 2 coats Semi-gloss (MPI Level #5) Alkyd Enamel (MPI Product #81 - Min. Solids Volume 53% & Max. VOC 380 grams/liter)
c) Minimum Total Dry Film Thickness: 4.0 mil

I. Exterior Cementitious Siding

1. Alkyd Enamel

a. 1 coat Exterior Alkyd Primer (MPI Product #5 - Min. Solids Volume 75% & Max. VOC 200 grams/liter), followed by:
b. 2 coats Flat-gloss (MPI Level #1) Alkyd Enamel (MPI Product #10 - Min. Solids Volume 53% & Max. VOC 380 grams/liter)
c. Minimum Total Dry Film Thickness: 4.0 mils

J. Interior Gypsum Board:

1. Latex Enamel

a. 1 coat Latex Primer (MPI Product #149), followed by:
b. 2 coats Eggshell-gloss (MPI Level #3) Latex Enamel (MPI Product #145)
c. Minimum Total Dry Film Thickness: 4.0 mils

K. Interior Galvanized Steel:

1. Latex Enamel

2. 1 coat Galvanized Primer, (MPI Product #134), followed by:
3. 2 coats Semi-gloss (MPI Level #5) Latex Enamel (MPI Product #11)
4. Minimum Total Dry Film Thickness: 4.0 mils

L. Interior Steel Handrails:

1. Polyurethane Enamel
2. 1 coat Epoxy Coating (MPI Product #17), followed by: 2 coats High-gloss (MPI Level #7) Polyurethane Enamel (MPI Product #72)
3. Minimum Total Dry Film Thicknesses: 5 mils

M. All Other Interior Ferrous Metal:

1. Latex Enamel
2. 1 coat Rust Inhibiting Primer (MPI Product #107), followed by:
3. 2 coats Semi-gloss (MPI Level #5) Latex Enamel (MPI Product #147)
4. Minimum m Total Dry Film Thickness: 4.0 mils

N. Interior Woodwork:

1. Stain:

   a. 2 coats Penetrating Oil Stain (MPI Product #90 - Min. Solids Volume 31% & Max. VOC 250 grams/liter)

2. Polyurethane Varnish

   a. 1 coat Paste Filler (MPI Product #91) colored to match Wood, on Open-grained Woods only, followed by:
   b. 1 coat Sanding Sealer (MPI Product #102 - Min. Solids Volume 25% & Max. VOC 250 grams/liter)
   c. 3 coats Semi-gloss (MPI Level #5) Polyurethane Varnish (MPI Product #74 - Min. Solids Volume 26% & Max. VOC 250 grams/liter)

3. Stain & Varnish

   a. 1 coat Penetrating Oil Stain, (MPI Product #90 - Min. Solids Volume 31% & Max. VOC 250 grams/liter), followed by:
   b. 1 coat Sanding Sealer (MPI Product #103) followed by:
   c. 3 coats Semi-gloss (MPI Level #5) Polyurethane Varnish (MPI Product #74 - Min. Solids Volume 26% & Max. VOC 250 grams/liter)

4. Latex Enamel

   a. 1 coat Latex Primer (MPI Product #5 - Min. Solids Volume 75% & Max. VOC 200 grams/liter), followed by:
   b. 2 coats Semi-gloss (MPI Level #5) Latex Enamel (MPI Product #147 - Min. Solids Volume 38% & Max. VOC 50 grams/liter)
   c. Minimum Total Dry Film Thickness: 4.0 mils

O. Exposed Mechanical & Electrical Work:

1. Exterior Metal, including Work on Roof & Utility Meter Box Bases:

   a. Finish same as other Exterior Metal of same kind.

2. Piping, Equipment, & Supports:

   a. 1 coat Anti-corrosive Metal Primer (MPI Product #79 - Min. Solids Volume 44% & Max. VOC 100 grams/liter), followed by:
   b. 2 coats Semi-gloss (MPI Level #5) Alkyd Enamel (MPI Product #81 - Min. Solids Volume 39% & Max. VOC 50 grams/liter)
   c. Minimum Total Dry Film Thickness: 4 mils

3. Mechanical Grilles, Diffusers, & Louvers:

   a. 1 coat Anti-corrosive Metal Primer (MPI Product #79 - Min. Solids Volume 44% & Max. VOC 100 grams/liter), followed by:
   b. 2 coats Semi-gloss (MPI Level #5) Alkyd Enamel (MPI Product #81) - Min. Solids Volume 39% & Max. VOC 50 grams/liter
   c. Minimum Total Dry Film Thickness: 4.0 mils

4. Electrical Conduit:

   a. 1 coat Galvanized Primer (MPI Product #134), followed by:
   b. 2 coats Semi-gloss (MPI Level #5) Latex Enamel (MPI Product #94)
   c. Minimum Total Dry Film Thickness: 4.0 mils

5. Electrical Panel Board Doors:

   a. 1 coat Galvanized Primer (MPI Product #134), followed by:
   b. 2 coats Semi-gloss (MPI Level #5) Latex Enamel (MPI Product #94)
   c. Minimum Total Dry Film Thickness: 4.0 mils

END OF SECTION

SECTION 10 14 00 - INTERIOR SIGNAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Interior Building Signage.
   2. Sign Type 1 - Primary Room ID (Sign Panel With Insert).
   3. Sign Type 2A - Secondary Room ID - Specialized Use (Sign Panel).
   4. Sign Type 2B - Secondary Room ID (Sign Panel With Insert).
   5. Sign Type 3 - Restroom ID (Sign Panel).
   6. Sign Type 4 - Maximum Occupancy (Sign Panel).
   8. Sign Type 6 - Exit Instructional (Sign Panel).
   9. Sign Type 7 - Evacuation Map (Sign Panel).
   10. Sign Type 8 - Sprinkler Riser Room (Sign Panel).
   11. Sign Type 9 - Roof Access (Sign Panel).
   12. Dedication Plaque (Stainless Steel Sign).

1.03 SCOPE OF WORK

A. Field verify site conditions and dimensions affecting signage installation and coordinate with signage design and installation.

B. Provide final design for signage based on the schematic level signage design shown in the Contract Documents.

C. Provide signage shop drawings showing the final design for each sign type required for the project.

1.04 REFERENCES

A. References shall be the latest adopted edition.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. IBC – International Building Code.

D. ICC / ANSI A117.1 - Accessible and Usable Buildings and Facilities.

E. Oregon Structural Specialty Code (OSSC), Chapter 11, Accessibility.

1.05 SUBMITTALS

A. Refer to Division 01 Section "Submittal Procedures" for submittal procedures.

B. Product Data: Submit manufacturer's technical data for each type of sign or manufactured component required.

C. Shop Drawings: Indicate size, thickness and finishes for each sign type; include methods of attachment for each different substrate and sign type. Provide details and sections at full size. Proposed deviations from the Contract Drawings shall be clearly identified.
   1. Installer to submit CAD generated location plan noting the location of each sign and cross referenced to sign type schedule.
   2. Copy Layout: Provide scaled drawings showing copy layout for each sign type. Show exact letter, number, symbols, arrows, letter / word / line size, spacing, margins, braille, etc. positioned within the sign face outline. Copy layouts will be adjusted during Architect's review when required to conform to the design intent; revise and resubmit for final approval.
   3. Text Information Supplied By Owner: Allow 60 days for Owner verification of signage text and room numbering during submittal process.
   4. Sign Samples: Submit two (2) different sign types for verification of materials, colors, graphics / pattern, typography, braille, method of attachment including fasteners if applicable, overall workmanship quality and conformance to Contract Drawing and Specification requirements. One sign type must show paper insert window. Acceptable samples will be retained on file as the standard of quality for the signage.
   5. Color Samples: Provide three (3) samples (3" x 5" minimum size), of each different color and texture required; samples shall be the actual materials used in signage and not photographic facsimiles.
   6. Operations And Maintenance Data: Submit operation and maintenance instructions for signage components.
      a. Provide cleaning instructions for each different surface / finish exposed to view on signage.
      b. Provide a comprehensive Signage Manual in both a paper and PDF format. The Manual shall include shop drawings, signage location plan, signage type and copy schedule, computer graphics files, paper insert templates, mounting details and signage reorder information.
         1) Include listing of product and color selections (manufacturer product and color number) for each different finish and color applied on signage.

1.06 MAINTENANCE MATERIALS

A. Paper Inserts: Provide 100 sheets of paper used for creating paper inserts.

1.07 QUALITY ASSURANCE

A. Signage Fabricator Qualifications: Not less than 5 years of successful experience in fabrication and installation of signage similar in type and scope to those required for this project, with record of successful fabrication and installation and sufficient capacity to produce and install the required signage within the project schedule.
   1. Obtain signs from one source and a single fabricator.
   2. The signage fabricator shall have broad in-house knowledge, diverse shop and field experience, flexibility, coordination ability, skilled craftsmen and a physical plant necessary to produce quality products equivalent to or superior to similar type products produced by other signage fabricators in the same area of expertise.
   3. Installers shall be employees of fabricator, trained and experienced in signage installation using best workmanship.
   4. Upon request, provide list of at least five (5) recently completed projects along with names and contact information for project Owner and Architect
   5. Workmanship / Quality: Signage fabrications shall employ the best fabrication practices common to the signage industry and to the highest standards of workmanship. Fabrications shall be free of imperfections in material and workmanship and suitable for its intended use and location.

1.08 FIELD CONDITIONS

A. Conduct inspection of conditions on project site and review of signage locations.

B. For signage that must fit closely within an existing condition or architectural detail, field measure and adjust sign to fit in the space.

C. Field verify / measure dimensions and review site conditions prior to submitting shop drawings and starting fabrication.

D. Coordinate signage work with Contract Drawings, change directives and as-built conditions.

1.09 DELIVERY, STORAGE & HANDLING

A. Package signage for protection during shipping, storage and installation.

B. Products should remain in original packaging until installation. Store products in a dry, indoor location.

1.10 PRE-INSTALLATION CONFERENCE

A. Prior to beginning signage installation work, convene a conference to review installation procedures and concerns, work schedule and sequencing / coordination with other work.
   1. The following persons shall attend Conference: Contractor, Signage Installer, Architect, and Owner.

1.11 WARRANTY

A. Provide one (1) year warranty covering the following:
   1. Signage shall be warranted against defects in materials and workmanship. Promptly correct at no expense to the Owner any defective signage resulting from defective or inferior materials or workmanship.
   2. Defective materials and workmanship include, but are not limited to, the following: Delaminating of sign parts or finishes, cupping, warping or dishing of surfaces, bubbling, crazing, chalking, or fading of finishes, rusting or corrosion of parts, installations that are not plumb or securely fastened, use of incorrect finishes or materials, or unapproved deviations from the Contract Documents or approved shop drawings.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. ADA Accessible Signage shall comply with to ICC / ANSI A117.1 Chapter 7 and Oregon Structural Specialty Code, Chapter 11, Accessibility. Signage shall comply with IBC, Chapters 9, 10 and 11 including color requirements.
   1. Character Proportion: Letters and numbers on signs shall have a width-to- height ratio between 3:5 and 1:1 and a stroke width-to-height ratio between 1:5 and 1:10.
   2. Color Contrast: Characters and symbols shall contrast with their background – either light characters on a dark background or dark characters on a light background.
   3. Raised Characters / Symbols: Letters, numbers and symbols shall be raised 1/32 inch minimum; letters and numbers shall be sans serif characters and have a height between 5/8 inch and 2 inches.
   4. Braille: Grade 2 with accompanying raised text.

2.02 FABRICATORS

A. Interior Signage Fabricators: The following fabricators are acceptable for providing signage for this project:
   1. Industry Graphics, Auburn, WA.
   2. Sign Solutions, Greenwood, IN.
   3. Or approved equal per Section 01 25 00

2.03 MATERIALS

A. Aluminum: Conform to ASTM B209, 5000 series, 6061-T6 and 6063 alloys selected for best performance for each sign application.
   1. Materials provided shall be free of surface blemishes such as pitting, roller marks, rolled trade names and surface roughness.
   2. Acrylic Sheet: Clear, plexiglass extruded acrylic sheet, non-glare surface.
      a. Manufacturers / Products:
         1) Acrylite FF.

2) Lucite CP.
3) Optix.

3. Photopolymer Sheet:
   a. Manufacturer / Product: Nova Polymers NovAcryl PT Series is the basis of design and the standard of quality, function and appearance required for this project.
   b. Photopolymer Sheet: 0.032 inch thick moisture resistant, non-glare interior nylon photopolymer bonded to ultraviolet resistant, clear PETG (polyethylene terephthalate glycol-modified) sign base, single piece construction. Flame spread / smoke developed rating less than 75/120, tested to ASTM E84 and UL 723
4. Hot Stamping Foil: Heat activated color pigmented foil for hot stamping color onto photopolymer sheet; use foil recommended by photopolymer sheet manufacturer for compatibility. Manufacturer / Product: Nova Polymers Hot Stamping Foils.
5. Cut Metal Letters: Computer controlled precision machine cut using waterjet cutting equipment for uniform appearance and cut finish.
   a. Use the exact typefaces specified; verify prior to production if there is any question about the identity of a specified typeface.
   b. Cut edges shall be smooth and free of tool or cutting marks.
   c. Edges shall be slightly eased to eliminate sharpness.
   d. Install 300 Series stainless steel threaded pins in backside of each letter for secure, theft-proof attachment.
6. Paint: Provide paint manufactured specifically for signage painting with excellent color and gloss retention and surface hardness. Use the same manufacturer for each coat specified for a given system.
   a. Manufacturers: Matthews Paint is the basis of design and the standard of quality, function and appearance required for this project. The following manufacturers are acceptable provided they can provide products that are equal to or exceed the products provided by Matthews Paint.
      1) Matthews Paint (basis of design).
      2) Sherwin Williams Genesis.
      3) AkzoNoble.
   b. Low Emitting Interior Finishes – Paints And Coatings: Paint applied during construction inside the building envelope shall meet Green Seal GS-11 Standard.
   c. Schedule – Paint Systems: Provide the following paint system for each different material:
      1) Aluminum:
         a) Pretreatment Cleaner: Clean surface with Matthews 45 330SP Speed Prep Cleaner.
         b) Prime Coat: Matthews 274 808SP / 274 909SP Black Epoxy Primer, or 274 908SP / 274 909SP White Epoxy Primer applied at 1.5 – 2.0 mils DFT.
         c) Top Coats: 2 coats of Matthews MPC 100 Acrylic Polyurethane (MAP) applied at 2 mils DFT.
         d) Clear Coats: 2 coats of Matthews MAP Clear applied at 2.0 mils DFT, gloss as selected by Architect.

e) Application: Spray.

2) Gloss: As selected by Architect.

3) Acrylic, PETG And PVC:

a) Surface Preparation / Cleaning: As recommended by paint manufacturer.

b) Prime Coat: Matthews 74 777SP Tie Bond Adhesive

c) applied at 1.5 – 2.0 mils DFT.

d) Top Coats: 2 coats of Matthews MPC 100 Acrylic Polyurethane (MAP) applied at 2 mils DFT.

e) Clear Coats: 2 coats of Matthews MAP Clear applied at 2.0 mils DFT, gloss as selected by Architect.

f) Application: Spray.

4) Gloss: As selected by Architect.

7. Vinyl Film: Premium quality, 2.0 mil, cast vinyl, opaque with high performance, permanent, clear pressure-sensitive acrylic adhesive.

a. Manufacturers / Products:

1) Avery Dennison SC 900 Super Cast Series.

2) Oracal 951.

3) 3M Company Scotchcal Series 7125.

8. Double-Side Adhesive Tape: 3M Company VHB Tape.

2.04 FABRICATION – GENERAL

A. Field verify dimensions and conditions on site prior to fabrication and confirm that proposed size and configuration for signage and graphics will fit the space and not conflict with other elements.

B. General: Fabricate interior signs from new materials using the best fabrication procedures, practices and workmanship that is common to the signage industry.

C. Metal Fabrications: Fabrication shall be smooth, free from abrasion, burrs, sharp edges, tool marks, visible welds, exposed fasteners, or similar defects. Corners, reveals, and joints shall be accurately milled to match adjoining pieces and shall be fabricated so that they are straight and / or configured to match the approved shop drawings.

1. Joints and seams shall be minimized by using the largest sheet size reasonably available.
2. Welds: External welds are to be continuous, filled, ground and sanded smooth so the finish seams are not apparent when the unit is completed. Internal welds shall be structurally sound and eliminate racking.
3. There shall be no visible seams or fasteners. Joints and connections shall be finished flush, true and smooth without defects. Finish welds on exposed surfaces, and spot welds shall be imperceptible in the finished work. No gaps, light leaks, oil-canning or waviness will be acceptable.
4. Fabricate for smooth and even appearance, free from imperfections and disfigurement including pitting, warping, waviness, bulges, oil-canning or other physical deformities

caused by such things as welding, material being too thin, fasteners, welds not being ground smooth, or any other problems not specifically mentioned here

5. Brake-Formed Aluminum: Bends shall not have crazing or cracking.
6. Painting: Conform to paint manufacturer's requirements for surface preparation / cleaning and application.
    a. Paints shall be evenly applied without pinholes, scratches, orange peeling, application marks and other imperfections. Workmanship, finishes and formation of letters shall conform to the highest standards of the trade.
    b. Color breaks on the sign surface are to be sharp, without serration or color bleed. Remove paint drops, splatters, and over sprays.
    c. The cured paint surface shall have a uniform finish that accurately matches the specified color, gloss or approved color samples.
7. Typography And Artwork: Conform to best industry practices and the following:
    a. Prepare original artwork for each sign. Artwork digital format files will be supplied only where indicated in the Contract Documents. Computer graphic files will be supplied by the Architect in the most recent version of Adobe Illustrator AI, PDF, or EPS formats.
    b. Use the exact typeface specified and shown on approved shop drawings. Provide copy layouts and text for signs; provide enlarging and reducing as required for layout.
    c. Letterforms, logos, patterns and other graphics shall be applied true to artwork / typeface and have clean edges and corners.
        1) Letterforms having rounded positive or negative corners, nicked, cut or ragged edges will not be acceptable.
        2) Letterforms shall be aligned to maintain a baseline parallel to the sign format and margins shall be maintained as per the Contract Documents.
        3) Photo silk-screened typography and graphics are to be sharp, without serrated or irregular edges, and exactly true to the letter style and design form.
        4) For the best results, silk-screening on an acrylic polyurethane coating should be done within 72 hours of the coating application.
8. Cut Vinyl Letters And Graphics: Conform to manufacturer's requirements for surface cleaning and application.
    a. Cut vinyl typography (including letters, arrows, numbers, symbols, logos, etc.) and graphics is to be vector artwork or photographically reproduced and computer processed (digitized or scanned) and precision machine cut.
    b. Use the exact typefaces specified; verify prior to production if there is any question about the identity of a specified typeface.
    c. Die cutting shall be executed in such a manner that all edges and corners are true and clean.
    d. Adhesion to substrate shall be permanent.
9. There shall be no visible labels, manufacturer's or otherwise, code permitting, on the completed signs. If labels are required, a sample label and intended location must be included with submittal for Architect's review.

2.05 INTERIOR SIGNAGE TYPES

A. Sign Type 1 – Primary Room ID (Sign Panel With Insert).
   1. Signage Type: Sign panel with insert.
   2. Overall Size: 8.5” wide x 10” high.
      a. Clear Insert Area: 8.5” wide x 5” high.
   3. Sign Construction (Sign Panel): 3 mm thick photopolymer sheet with raised text and Grade 2 braille adhered to 1/8” acrylic backer panel with 1/16” clear acrylic spacer to create area for paper inserts.
      a. ADA compliant raised copy and braille.
      b. Finish: Paint the back face of photopolymer sheet.
      c. Adhere sign panel layers with a clear double-faced tape.
   4. Opaque Film Back (if sign is mounted on glass): White cut vinyl 1/4” smaller than sign panel; installed on back side of glass behind sign panel.
   5. Text: Raised 0.032 inch above sign face.
      a. Typography: Futura Light
      b. Apply color to raised text with hot stamping foil or paint.
   6. Colors: As indicated on Drawings.
   7. Paper Inserts: Provided by sign contractor.
   8. Tack Strips: 8.5” wide x 2” high mounted below the sign.
   9. Installation: Adhere to wall using 3M VHB double-faced tape.

B. Sign Type 2A – Secondary Room ID – Specialized Use (Sign Panel).
   1. Signage Type: Sign panel.
   2. Overall Size: 8.5” wide x 4.5” high.
   3. Sign Construction (Sign Panel): 3 mm thick photopolymer sheet with raised text and Grade 2 braille adhered to 1/8” acrylic backer panel.
      a. ADA compliant raised copy and braille.
      b. Finish: Paint the back face of photopolymer sheet.
      c. Adhere sign panel layers with a clear double-faced tape.
   4. Text: Raised 0.032 inch above sign face.
      a. Typography: Futura Light
      b. Apply color to raised text with hot stamping foil or paint.
   5. Opaque Film Back (if sign is mounted on glass): White cut vinyl 1/4” smaller than sign panel; installed on back side of glass behind sign panel.
   6. Colors: As indicated on Drawings.

C. Sign Type 2B – Secondary Room ID (Sign Panel With Insert).
   1. Signage Type: Sign panel with insert.
   2. Overall Size: 8.5” wide x 6” high.
      a. Clear Insert Area: 8.5” wide x 1.5” high.
   3. Sign Construction (Panel): 3 mm thick photopolymer sheet with raised text and Grade 2 braille adhered to 1/8” acrylic backer panel with 1/16” clear acrylic spacer to create area for paper inserts.
      a. ADA compliant raised copy and braille.

b. Finish: Paint the back face of photopolymer sheet.
c. Adhere sign panel layers with a clear double-faced tape.

4. Text: Raised 0.032 inch above sign face.
   a. Typography: Futura Light.
   b. Apply color to raised text with hot stamping foil or paint.
5. Opaque Film Back (if sign is mounted on glass): White cut vinyl 1/4” smaller than sign panel; installed on back side of glass behind sign panel.
6. Colors: As indicated on Drawings.
7. Paper Inserts: Provided by sign contractor.
8. Installation: Adhere to wall using 3M VHB double-faced tape.

D. Sign Type 3 – Restroom ID (Sign Panel).
   1. Signage Type: Sign panel.
   2. Overall Size: 8.5” wide x 10” high.
   3. Sign Construction (Sign Panel): 4.8 mm thick photopolymer sheet with raised text and symbol, and Grade 2 braille.
      a. ADA compliant raised copy, symbol and braille.
         1) Finish: Paint the back face of photopolymer sheet.
   4. Text: Raised 0.032 inch above sign face.
      a. Typography: Futura Light.
      b. Apply color to raised text and symbol with hot stamping foil or paint.
   5. Colors: As indicated on Drawings.
   6. Installation: Adhere to wall using 3M VHB double-faced tape.

E. Sign Type 4 – Maximum Occupancy (Sign Panel).
   1. Sign Type: Sign panel.
   2. Overall Size: 12” wide x 6” high.
   3. Sign Construction: 1/4” thick acrylic sheet.
      a. Finish: Paint on back side of panel.
   4. Text: Painted on back face.
      a. Typography: Futura Light.
   5. Colors: As indicated on Drawings.
   6. Installation: Adhere to wall using 3M VHB double-faced tape.

F. Sign Type 5 – Elevator ID (Sign Panel).
   1. Sign Type: Sign Panel.
   2. Overall Size:
   3. Sign Construction: 4.8 mm photopolymer sheet with raised text and Grade 2 braille.
      a. ADA compliant raised copy and braille.
      b. Finish:
      c. Text: Raised 0.032 inch above sign face.
         1) Typography: Futura Light
      d. Colors: See architectural Drawings.
      e. Installation: Adhere to wall using 3M VHB double-faced tape.

G. Sign Type 6 - Exit Instructional (Sign Panel).
   1. Sign Type: Sign panel.
   2. Overall Size: 6” wide x 6” high.
   3. Sign Construction: 4.8 mm photopolymer sheet with raised text and Grade 2 braille.
      a. ADA compliant raised copy and braille.
      b. Finish: Paint the back face of photopolymer sheet.
   4. Text: Raised 0.032 inch above sign face.
      a. Typography: Futura Light.
      b. Apply color to raised text and symbol with hot stamping foil or paint.
   5. Colors: As indicated on Drawings.
   6. Installation: Adhere to wall using 3M VHB double-faced tape.

H. Sign Type 7 – Evacuation Map (Sign Panel)
   1. Sign Type: Sign panel with framed insert.
   2. Overall Size: 20.5” wide x 16.75” high.
      a. Clear Insert Area: 18” wide x 12” high.
   3. Sign Construction: 1/8” acrylic sheet.
      a. Insert Area Frame: Surface-mounted 12” x 18” aluminum bar stock frame with tight butt joints; rout pockets to accommodate .063” non- glare acrylic sheet. Secure aluminum frame to acrylic backer panel with 3M VHB tape.
      b. Finish: Paint on back side of panel.
   4. Text: Painted on back face.
      a. Typography: Futura Bold.
   5. Colors: As indicated on Drawings.
   6. Paper Inserts: Evacuation map insert provided by sign contractor.
   7. Installation: Adhere to wall using 3M VHB double-faced tape.

I. Sign Type 8 - Sprinkler Riser Room (Sign Panel)
   1. Sign Type: Sign Panel.
   2. Overall Size:
   3. Sign Construction:
      a. Finish:
   4. Text:
      a. Typography: Futura Light.
   5. Colors: As indicated on Drawings.
   6. Installation:

J. Sign Type 9 - Roof Access (Sign Panel)
   1. Sign Type: Sign Panel.
   2. Overall Size:
   3. Sign Construction: 4.8 mm photopolymer sheet with raised text and Grade 2 braille.
      a. ADA compliant raised copy and braille.
      b. Finish:
   4. Text:
      a. Typography: Futura Light.

5. Colors: See architectural Drawings.
6. Installation: As indicated or as otherwise directed by Architect.

K. Sign Type 10 - Occupant Load Signs (Sign Panel)
1. Sign Type: Sign Panel.
2. Location: Provide for assembly spaces as required.
a. Coordinate with Architect and Owner for occupant load numbers corresponding to maximum allowable occupancy or less, if desired, for each room.

L. Dedication Plaque (Bronze Sign)
1. Sign Type: Engraved Plate .
2. Overall Size: No smaller than 16” x 18”.
3. Sign Construction: Stainless Steel.
4. Text: TBD.
a. Typography: Arial
5. Colors: See architectural Drawings.
6. Installation: As indicated or as otherwise directed by Architect.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate signage installation with work of other trades.

B. Coordinate signage installation schedules with General Contractor.

3.02 EXAMINATION

A. Examine the substrate and conditions under which the signs are to be installed and verify that all such work is complete for proper installation of the signs. Installer shall notify General Contractor of unsatisfactory conditions; installer shall not proceed until unsatisfactory conditions are corrected.

B. Verify clearance, anchorage methods and final location for each sign before installation.

C. Install signs after all wall and ceiling surfaces are painted and finished.

D. Start of installation indicates acceptance of substrate and conditions as acceptable.

3.03 INSTALLATION

A. Sign installation Foreman shall be present on site and directly controlling the signage installation work at all times that signage work is in progress on site.

B. Install signage in locations noted on Drawings in accordance with fabricator’s / manufacturer’s installation instructions.
1. Install signs level, plumb, and true.

2. Mount signage in conformance with location requirements contained in the IBC, ICC / ANSI A117.1 and Oregon Structural Specialty Code, Chapter 11, Accessibility.
3. Mount signage securely to substrate surface in conformance with mounting methods shown on shop drawings and in compliance with fabricator's / manufacturer's instructions.
4. Installation shall be performed by fabricator's / manufacturer's personnel trained and experienced in fabricator's / manufacturer's recommended installation methods and procedures.
5. Install signage level, plumb and at the proper height with sign surfaces free from defects. Mounting height shall be in accordance with ADA requirements. Refer also to drawings / schedules for signage installation requirements.
6. Upon completion of the work, remove unused or discarded materials, containers and debris from site.

3.04 WORKMANSHIP

A. Signage shall be installed using the best workmanship, including the following:
   1. Consistent color, gloss and finish appearance; surfaces free of discoloration, hazing, inconsistent gloss, or defects.
   2. Signs installed plumb, level, in square alignment and at required height.
   3. Free-standing signs securely attached and free of movement or misalignment.
   4. No scratches, stains or damage on signs.
   5. Fasteners installed securely into solid backing / substrate.
   6. Fasteners installed square with sign face and tightened down snug without misalignment, overtightening or space under head.
   7. Finished surfaces free of discoloration, hazing, inconsistent gloss, or defects.

3.05 CLEANING

A. Clean sign surfaces and touch up any flaws or marring caused during installation. Signage shall be clean and free of glue, tape, and other extraneous materials.

B. Clean the site and signage, removing debris related to the installation of the signs.

3.06 PROTECTION OF WORK

A. Protect signage from damage during construction.

B. Repair any finishes on signs and surrounding architectural surfaces damaged during field installation so there is no evidence of corrective work. Return items which cannot be refinished in the field to the shop, make required alterations, and refinish the entire unit or provide new unit at fabricator's option.

3.07 FIELD QUALITY CONTROL

A. Contractor Quality Control: Employ / assign quality control personnel to monitor the work of this section for conformance to the requirements of this section and to good construction practices.
   1. Contractor is solely responsible for managing and controlling the quality of the work and conformance with the requirements of this section.

3.08 SIGNAGE SCHEDULE AND LOCATION PLAN

A. Refer to Drawings.

END OF SECTION

SECTION 10 14 13 - EXTERIOR SIGNAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Exterior Building Signage.
   2. Sign Type A2 - Pylon Digital Reader Board Sign (Alternate).
   3. Sign Type A3 and A4 – Primary Building ID (Individual Letters).
   4. Sign Type A5 – Exterior Graphic (Cut Vinyl Letters).
   5. Sign Type A-11A and A-11B – Exterior Free-Standing Informational Signage.

1.03 SCOPE OF WORK

A. Field verify site conditions and dimensions affecting signage installation and coordinate with signage design and installation.

B. Provide final design for signage based on the schematic level signage design shown in the Contract Documents.

C. Provide signage shop drawings showing the final design for each sign type required for the project.

D. Provide engineering design for exterior pylon signs.

E. Submit signage drawings to local Authority Having Jurisdiction (AHJ) for review and approval; revise final signage drawings as required for approval by AHJ.

F. Secure sign and electrical permits required by AHJ, pay permit fees and coordinate inspections by AHJ of the installed signage.

G. Install signage in accordance with approved shop drawings.

1.04 REFERENCES

A. References shall be the latest adopted edition.

B. ASTM A36 - Standard Specification for Carbon Structural Steel.

C. ASTM A53 - - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc- Coated, Welded and Seamless.

D. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

G. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

H. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

I. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

J. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

K. ASTM C33 - Standard Specification for Concrete Aggregates.

L. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

M. ASTM C150 - Standard Specification for Portland Cement.

N. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

O. AWS D1.1 - Structural Welding Code - Steel; American Welding Society.

P. SSPC - Steel Structures Painting Manual, Steel Structures Painting Council.

Q. IBC – International Building Code.

R. ICC / ANSI A117.1 - Accessible and Usable Buildings and Facilities.

S. 2010 ADA Standards for Accessible Design and the latest adopted edition of the Oregon Structural Specialty Code (OSSC).

T. 2011 Oregon Elevator Specialty Code.

1.05 SUBMITTALS

A. Refer to Division 01 Section "Submittal Procedures" for submittal procedures.

B. Product Data: Submit fabricator’s technical data for each manufactured component required.

C. Shop Drawings: Provide shop drawings showing locations of signage on site plan, plan view, elevations, sections, details, anchoring method, materials, finishes, signage structures and connections, lighting, artwork.
   1. Copy Layout Drawings: Provide scaled drawings showing copy layout for each sign type. Show exact letter, number, symbols, arrows, letter / word.

a. / line size, spacing, margins, etc. positioned within the sign face outline. Copy layouts will be adjusted during Architect's review when required to conform to the design intent; resubmit for final approval.

2. Include structural design and include design criteria. Shop drawings shall bear the seal of a Professional Engineer currently licensed in the State of Oregon.
3. Include electrical design criteria (voltage, loads, wire size, etc.) along with electrical rough-in layout, locations and dimensions.

D. Text Information Supplied By Owner: Allow 60 days for Owner verification of signage text noted herein to be verified by Owner during submittal process.

E. Color Samples: Provide three (3) samples (3" x 5" minimum size), of each different color and texture required; samples shall be the actual materials used in signage and not photographic facsimiles.

F. Deferred Submittal To Authorities Having Jurisdiction (AHJ): Submit signage shop drawings to the AHJ for review and approval as a deferred submittal; provide format; information and number of copies required by AHJ. Make any revisions and provide any additional information required to obtain approval by AHJ.

G. Operations And Maintenance Data: Submit fabricator's operation and maintenance instructions for signage and electrical components.
1. Provide cleaning instructions for each different surface / finish exposed to view on signage.
2. Provide a comprehensive Signage Manual in both a paper and PDF format. The Manual shall include shop drawings, signage location plan, signage type and copy schedule, computer graphics files, mounting details and signage reorder information.
   a. Include listing of product and color selections (manufacturer product and color number) for each different finish and color applied on signage.
3. Provide instructions for using the computer software for the LED electronic signs.

1.06 QUALITY ASSURANCE

A. Signage Fabricator Qualifications: Not less than 5 years of successful experience in fabrication and installation of signage similar in type and scope to those required for this project, with record of successful fabrication and installation and sufficient capacity to produce and install the required signage within the project schedule.
1. Obtain signs from one source and a single sign fabricator.
2. The signage fabricator shall have broad in-house knowledge, diverse shop and field experience, flexibility, coordination ability, skilled craftsmen and a physical plant necessary to produce quality products equivalent to or superior to similar type products produced by other signage fabricators in the same area of expertise.
3. Installers shall be employees of fabricator trained and experienced in signage installation using best workmanship.
4. Upon request, provide list of at least five (5) recently completed projects along with names and contact information for project Owner and Architect.

B. Workmanship / Quality: Signage fabrications shall employ the best fabrication practices common to the signage industry and to the highest standards of workmanship. Fabrications shall be free of imperfections in material and workmanship and suitable for its intended use and location.

C. Welders: Qualified within the previous 12 months for type of welding required and certified as required by local Building Official having jurisdiction on this project.

1.07 REGULATORY REQUIREMENTS

A. Permits: Obtain and pay for any signage related permits required by state and local authorities having jurisdiction. Sign permits shall be obtained before beginning fabrication of the signage.

B. Signage Requiring Electrical Connection: Electrical components shall be tested and labeled by Underwriters Laboratories, Inc., as suitable for the installed environment and the intended purpose.

1.08 FIELD CONDITIONS

A. Conduct an on-site inspection of building and site conditions and review of signage locations prior to preparing submittals.

B. For signage that must fit closely within an existing condition or architectural detail, field measure and adjust sign to fit in the space.

C. Field verify / measure dimensions and review site conditions prior to submitting shop drawings.

D. Coordinate signage work with Contract Drawings, change directives and as-built conditions.

1.09 DELIVERY, STORAGE & HANDLING

A. Package signage for protection during shipping, storage and installation.

B. Products should remain in original packaging until installation. Store products in a dry, indoor location.

1.10 PRE-INSTALLATION CONFERENCE

A. Prior to beginning signage installation work, convene a conference to review installation procedures and concerns, work schedule and sequencing / coordination with other work.
   1. The following persons shall attend Conference: Contractor, Signage Installer, Architect, and Owner.
   2. Stake the locations for freestanding and pylon signs on site prior to conference for review by attendees.

1.11 WARRANTY

A. Provide one (1) year warranty covering the following:
   1. Signage shall be warranted against defects in materials and workmanship. Promptly correct at no expense to the Owner any defective signage resulting from defective or inferior materials or workmanship.
   2. Defective materials and workmanship include, but are not limited to, the following: Delaminating of sign parts or finishes, cupping, warping or dishing of surfaces, bubbling, crazing, chalking, or fading of finishes, rusting or corrosion of parts, installations that are not plumb or securely fastened, use of incorrect finishes or materials, or unapproved deviations from the Contract Documents or approved shop drawings.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. ADA Accessible Signage shall comply with to ICC / ANSI A117.1 Chapter 7 and IBC, Chapters 9, 10 and 11 including color requirements.

B. Fabricator is responsible for providing engineering design for foundations, sign structures and sign electrical components for compliance with applicable local, state and national codes and ordinances.

C. Engage professional engineers licensed in the State of Oregon to design and engineer structural and electrical elements.

D. Exterior signs shall be engineered to conform to structural requirements for seismic, wind and snow loads in compliance with applicable local, state and national codes and ordinances.

2.02 FABRICATORS

A. Exterior Signage Fabricators: The following fabricators are acceptable for providing signage for this project:
   1. Industry Graphics, Auburn, WA.
   2. Sign Solutions, Greenwood, IN
   3. Doty Signs, Kirkland, WA.
   4. Sign Dog Media, Puyallup, WA.
   5. Approved local signage company.

2.03 MATERIALS

A. Concrete: Provide concrete with 4,000 psi (minimum) compressive strength at 28 day from the following materials:
   1. Reinforcing Steel: Conform to ASTM A615 and structural design on shop drawings.
   2. Cement: Type I or II Portland cement conforming to ASTM C150, gray color.
   3. Concrete Aggregate: Sand and gravel aggregates conforming to ASTM C33.

4. Water: Clean, potable, free of any substances or contaminants adversely affecting concrete.
5. Air Entrainment: 5 to 7 percent (by volume) using air entrainment admixture conforming to ASTM C260.
6. Admixtures: Water reducing agents are permitted, calcium is not allowed.
7. Maximum Water / Cement Ratio: 0.45.
8. Maximum Slump: 5 inches.

B. Steel: Conform to the following:
1. Steel Shapes: ASTM A36.
2. Steel Tubing: ASTM A500, Grade B.
3. Steel Pipe: ASTM A 53.
4. Steel Plate: ASTM A283.
5. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 with matching ASTM A563 nuts and ASTM F436 washers.
6. Steel nuts and bolts shall conform to ASTM A307, galvanized in conformance with ASTM A153.
7. Welding Materials: AWS D1.1; type required for materials being welded.
8. Cleaning: Clean steel surfaces in accordance with SSPC SP-3, Power Tool Cleaning to remove rust, scale, oil, grease, and foreign matter.
9. Hot-Dipped Galvanizing: Conform to ASTM A123 after fabrication is completed.

C. Aluminum: Conform to ASTM B209, 5000 series, 6061-T6 and 6063 alloys selected for best performance for each sign application.
1. Materials provided shall be free of surface blemishes such as pitting, roller marks, rolled trade names, deformation, scratches or surface roughness.

D. Paint: Provide paint manufactured specifically for signage painting with excellent color and gloss retention and surface hardness. Use the same manufacturer for each coat specified for a given system.
1. Manufacturers: Matthews Paint is the basis of design and the standard of quality, function, performance and appearance required for this project. The following manufacturers are acceptable provided they can provide products that are equal to or exceed the products provided by Matthews Paint.
    a. Matthews Paint (basis of design, specified).
    b. Sherwin Williams Genesis.
    c. AkzoNoble.
2. Schedule – Paint Systems: Provide the following paint system for each different material:
    a. Steel:
        1) Surface Preparation: As recommended by paint manufacturer.
        2) Pretreatment Cleaner: Clean surface with Matthews.
            a) 45 330SP Speed Prep Cleaner.
        3) Prime Coat: Matthews 274 808SP / 274 909SP Black Epoxy Primer, or 274 908SP / 274 909SP White Epoxy Primer applied at 1.5 – 2.0 mils DFT.

4) Top Coats: 2 coats of Matthews MPC 100 Acrylic Polyurethane (MAP) applied at 2 mils DFT.
5) Clear Coats: 2 coats of Matthews MAP Clear applied at 2.0 mils DFT, gloss as selected by Architect.
6) Application: Spray.

b. Gloss: As selected by Architect.

c. Aluminum:
1) Pretreatment Cleaner: Clean surface with Matthews.
a) 45 330SP Speed Prep Cleaner.
2) Prime Coat: Matthews 274 808SP / 274 909SP Black Epoxy Primer, or 274 908SP / 274 909SP White Epoxy Primer applied at 1.5 – 2.0 mils DFT.
3) Top Coats: 2 coats of Matthews MPC 100 Acrylic Polyurethane (MAP) applied at 2 mils DFT.
4) Clear Coats: 2 coats of Matthews MAP Clear applied at 2.0 mils DFT, gloss as selected by Architect.
5) Application: Spray.

d. Gloss: As selected by Architect.

E. Vinyl Film: Premium quality, 2.0 mil, cast vinyl, opaque with high performance, permanent, clear pressure-sensitive acrylic adhesive.
1. Manufacturers / Products:
a. Avery Dennison SC 900 Super Cast Series.
b. Oracal 951.
c. 3M Scotchcal Series 7125.

2.04 FABRICATION – GENERAL

A. Confirm dimensions and installation conditions prior to fabrication.

B. General: Fabricate exterior signs from new materials using the best fabrication procedures, practices and workmanship that is common to the signage industry.

C. Design, engineer and fabricate exterior signs to prevent problems caused by weather, expansion and contraction, condensation, corrosion, exposure to UV and other problems resulting from exposure to the elements.

D. Freestanding Signs: Design and engineer to accommodate existing soil conditions, wind load requirements, overhead power lines, setback requirements.

E. Metal Fabrications: Fabrication shall be smooth, free from abrasion, burrs, sharp edges, tool marks, visible welds, exposed fasteners, or similar defects. Corners, reveals, and joints shall be accurately milled to match adjoining pieces and shall be fabricated so that they are straight and / or configured to match the approved shop drawings.
1. Joints and seams shall be minimized by using the largest sheet size reasonably available.
2. Welds: External welds are to be continuous, filled, ground and sanded smooth so the finish seams are not apparent when the unit is completed. Internal welds shall be structurally sound and eliminate racking.

3. Internal concealed framing / bracing shall be galvanized steel or aluminum for corrosion resistance. Internal concealed fasteners shall be hot-dipped galvanized or stainless steel.
4. There shall be no visible seams or fasteners. Joints and connections shall be finished flush, true and smooth without defects. Finish welds on exposed surfaces, and spot welds shall be imperceptible in the finished work. No gaps, light leaks, oil-canning or waviness will be acceptable.
5. Fabricate for smooth and even appearance, free from imperfections and disfigurement including pitting, warping, waviness, bulges, oil-canning or other physical deformities caused by such things as welding, material being too thin, fasteners, welds not being ground smooth, or any other problems not specifically mentioned here
6. Brake-Formed Aluminum: Bends shall not have crazing or cracking.
7. When dissimilar metals are in contact, the contacting surfaces shall be separated by non-conducting tape or coating to prevent oxidation and electrolysis. Aluminum and steel shall not come in contact with each other.

F. Cut Metal Letters and Aluminum Plate Cutout: Computer controlled precision machine cut using waterjet cutting equipment for uniform appearance and cut finish.
1. Use the exact typefaces specified; verify prior to production if there is any question about the identity of a specified typeface.
2. Cut edges shall be smooth and free of tool or cutting marks.
3. Edges shall be slightly eased to eliminate sharpness.
4. Install 300 Series stainless steel threaded pins for secure, theft-proof attachment.

G. Painting: Conform to paint manufacturer’s requirements for surface preparation / cleaning and application.
1. Paints shall be evenly applied without pinholes, scratches, orange peeling, application marks and other imperfections. Workmanship, finishes and formation of letters shall conform to the highest standards of the trade.
2. Color breaks on the sign surface are to be sharp, without serration or color bleed. Remove paint drops, splatters, and over sprays.
3. The cured paint surface shall have a uniform finish that accurately matches the specified color, gloss or approved color samples.

H. Vinyl Graphics: Conform to manufacturer’s requirements for surface cleaning and application.
1. Graphics is to be vector artwork or photographically reproduced and computer processed (digitized or scanned) and precision machine cut.
2. Use the exact typefaces specified; verify prior to production if there is any question about the identity of a specified typeface.
3. Die cutting shall be executed in such a manner that all edges and corners are true and clean.
4. Adhesion to substrate shall be permanent.

I. There shall be no visible labels, manufacturer’s or otherwise, code permitting, on the completed signs. If labels are required, a sample label and intended location must be included with submittal for Architect’s review.

2.05 EXTERIOR SIGNAGE TYPES

A. Monument Sign - Pylon Digital Reader Board:
   1. Signage Type: Free-standing pylon sign.
   2. Overall Size: As indicated on Drawings.
      a. LED Electronic Message Center: As indicated on Drawings.
      b. Back-Lit Compartment For School Identification: As indicated on Drawings.
   3. Sign Construction (Base): Steel post with concrete footing.
      a. Bottom of footing shall be 24 inches (minimum) below surrounding finish grade; deeper when required by structural design.
      b. Concrete shall conform to the requirements specified in this section.
      c. Foundation and steel post shall be engineered to resist seismic and wind forces on sign.
      d. Cover On Steel Post: Painted heavy gauge sheet metal surround fabricated to dimensions shown on Drawings and engineered by fabricator.
   4. LED Electronic Message Center:
      a. Basis-of-Design Product: Subject to compliance with requirements, provide Daktronics; Galaxy eCCB (electronic changeable copy board) 19.8 mm RED or a comparable product by one of the following:
         1) ThinkSign.
         2) Watchfire Signs.
      b. Sign Enclosure: Provide standard Daktronics metal enclosure for enclosing the two LED Electronic Message Centers.
         1) Graphic Capability: Fixed format text only.
      c. Display Configuration: Two-view (2V).
      d. Lines xColumns: 48 x100.
      e. Cabinet Dimensions: 4' - 0" H x 8' - 0" W x 5" D.
      f. Character Height: 11–16.5 inches.
      g. Lines: 3.
      h. Characters/line: 11-13.
      i. LED Color: Red.
      j. Power Requirements: 120 VAC single phase.
      k. Regulatory Compliance: UL listed, FCC compliant.
      l. Control: Users control the display from any Wi-Fi ready mobile phone or tablet through a web browser.
      m. Control Software: Web Browser Based Interface.
      n. Manufacturer’s Warranty Coverage: 5 years.
   5. Owner Training: Provide 1.5 hours of one-on-one online training for Owner’s personnel on setup and use of browser-based control software.
   6. Finishes / Colors: Shop paint finish the sign enclosure and steel post after fabrication.
      a. Colors:
         1) Enclosure: As indicated on Drawings.
         2) Steel Post: As indicated on Drawings.
   7. Applied Signage:
      a. Typography: As indicated on Drawings.

b. Sign Type: Cut Vinyl Letters (Individual numbers).
   1) Size and typography: As indicated on Drawings.
c. Individual Cut Letters: Flat aluminum letters cut from 3/4-inch thick plate.
   1) Size and typography: As indicated on Drawings.
   2) Provide concealed threaded stainless steel pins for mounting.
   3) Finish: As indicated on Drawings.

B. Applied Vinyl Copy - Exterior Graphic Cut Vinyl Letters:
1. Signage Type: Cut vinyl letters.
2. Overall Size: As indicated on Drawings.
3. Text Copy and Typography: As indicated on Drawings.
4. Color: As indicated on Drawings.

C. Aluminum Letters - Individual Cut Letters:
1. Flat aluminum letters cut from 3/4-inch thick plate.
2. Size and typography: As indicated on Drawings.
3. Provide concealed threaded stainless steel pins for mounting with stand-off spacer.
4. Finish: As indicated on Drawings.

D. Aluminum Plate Cutout - Mountain Silhouette of Sisters:
1. Flat aluminum cut-outs from 3/4-inch minimum thick plate as required to resist windloads.
2. Size and shape: As indicated on Drawings.
3. Mounting: Concealed studs.
   a. Stud mount with 1-inch stand-off spacer sleeve and threaded stainless steel fasteners achored into solid structure and solid blocking.
4. Finish: As indicated on Drawings.

E. Exterior Free-Standing Informational Signage (Post- Mounted Sign):
1. Signage Type: Post mounted directional sign in the configuration as indicated on Drawings.
2. Overall Size: As indicated on Drawings.
3. Sign Face Construction: Aluminum plate sign faces attached to hot-dipped galvanized steel posts with concrete footing.
4. Fabrication:
   a. Sign Faces (2 Panels Per Sign): Fabricate from 1/4 inch aluminum plate free of any dents, deformation, scratches or damage.
      1) Outside Corners: Radius cut edges of aluminum plate 1/4 inch minimum. Seal joint between faces watertight.
   b. Sign Top: Fabricate from 1/4 inch aluminum plate free of any dents, deformation, scratches or damage.
      1) Outside Corners: Radius cut edges of aluminum plate 1/4 inch minimum. Seal perimeter joint watertight.
   c. Sign Post And Foundation: Hot-dipped galvanized square tube steel posts with concrete footing.

1) Attachment Of Sign Faces: Provide internal concealed aluminum attachment brackets for bolted attachment of sign faces to steel tube posts.
2) Concrete shall conform to the requirements specified in this section.
3) Foundation and steel post shall be engineered to resist seismic and wind forces on sign.

5. Finishes, Graphics And Colors: Shop paint finish the sign faces and posts after fabrication. Silk-screen typography and graphics on front and back of sign panel as indicated on Drawings.
   a. Custom Colors: As indicated on Drawings.
   b. Typography: As indicated on Drawings.

PART 3 - EXECUTION

3.01 COORDINATION

A. Review, coordinate and accommodate work of other trades that interface with, affect or are affected by the work of this section so as to facilitate the execution of the overall Work of this project in a coordinated and efficient manner.

B. Coordinate signage installation with work of other trades.

C. Coordinate signage installation schedules with General Contractor.

D. Coordinate location of electrical rough-in for signs with electrical installer.

E. Coordinate location and type of backing and support for signage mounted on building.

3.02 EXAMINATION

A. Contractor, Sign Contractor, Architect and Owner's Representative shall conduct a walk through to review staked out sign locations.

B. Examine the substrate work by others and conditions under which the signs are to be installed and verify that all such work is complete for proper installation of the signs. Installer shall notify General Contractor of unsatisfactory conditions; installer shall not proceed until unsatisfactory conditions are corrected.

C. Verify dimensions, clearance, anchorage methods and final location for each sign before installation.

D. Install wall-mounted signs after wall surfaces are painted and finished.

E. Do not install pylon signs until concrete foundation has attained design compressive strength.

F. Start of installation indicates acceptance of substrate and conditions as acceptable.

3.03 CONCRETE BASE – PYLON SIGNS

A. Construct concrete footings / base in accordance with engineered design shown on shop drawings.

B. Footings shall bear on undisturbed native soil or on unyielding structural fill compacted to 95% density that is free of any organic materials or topsoil.

C. Install reinforcing steel as shown on shop drawings.

D. Install electrical conduits for power and data concealed within concrete base and steel post.

E. Consolidate concrete during placement using concrete vibrators.

F. Moisture cure concrete for not less than seven days.

G. Finish trowel exposed concrete surfaces to smooth, dense surface and slope for water runoff.

3.04 INSTALLATION - SIGNAGE

A. Sign installation Foreman shall be present on site and directly controlling the signage installation work at all times that signage work is in progress on site.

B. Install signage in locations noted on Drawings in accordance with fabricator's installation instructions and shop drawings.
   1. Install signs level, plumb, and true.
   2. Mount signage in conformance with location requirements contained in the IBC, ICC / ANSI A117.1 and Oregon Structural Specialty Code (OSSC) amendments.
   3. Mount signage securely to substrate surface using noncorrosive fasteners in conformance with mounting methods shown on shop drawings and in compliance with fabricator's instructions.
   4. Installation shall be performed by sign fabricator's personnel trained and experienced in fabricator's recommended installation methods and procedures.

C. Install signage level, plumb and at the proper height with sign surfaces free from defects. Mounting heights shall conform to ADA requirements. Refer also to drawings / schedules for signage installation requirements.

D. Securely attach free-standing signs to concrete base in conformance with structural design shown on the shop drawings.

E. Cut Vinyl Graphics / Letters: Install to clean, dry surfaces in accordance with manufacturer's installation instructions.

F. Upon completion of the work, remove unused or discarded materials, containers and debris from site.

3.05 WORKMANSHIP

A. Signage shall be installed using the best workmanship, including the following:

1. Consistent color, gloss and finish appearance; surfaces free of discoloration, hazing, inconsistent gloss, or defects.
2. Signs installed plumb, level, in square alignment and at required height.
3. Free-standing signs securely attached and free of movement or misalignment.
4. No scratches, stains or damage on signs.
5. Fasteners installed securely into solid backing / substrate.
6. Fasteners installed square with sign face and tightened down snug without misalignment, overtightening or space under head.
7. Landscaping around monument and pylon signs restored and excess soil removed.
8. No damage to surrounding finishes or work.

3.06 CLEANING

A. Clean sign surfaces and touch up any flaws or marring caused during installation. Signage shall be clean and free of glue, tape, and other extraneous materials.

B. Clean the site and signage, removing debris related to the installation of the signs.

3.07 PROTECTION OF WORK

A. Protect signage from soiling and damage during and after installation.

B. Repair any finishes on signs and surrounding architectural surfaces damaged during field installation so there is no evidence of corrective work. Return items which cannot be refinished in the field to the shop, make required alterations, and refinish the entire unit or provide new unit at fabricator’s option.

3.08 FIELD QUALITY CONTROL

A. Contractor Quality Control: Employ / assign quality control personnel to monitor the work of this section for conformance to the requirements of this section and to good construction practices.
   1. Contractor is solely responsible for managing and controlling the quality of the work and conformance with the requirements of this section.

B. Owner may elect to engage an independent testing and inspection agency to perform field inspections and tests and prepare test reports, in accordance with Division 01 Section "Quality Requirements."
   1. Coordinate inspection of field connections by independent testing company when connections are accessible and prior to cover.
   2. Provide testing agency with access to the work to allow required inspections and testing.
   3. Correct deficiencies or remove and replace any work that inspections and test reports indicate do not comply with specified requirements.
   4. Non-conforming work will be reinspected and tested for compliance at Contractor’s expense.

C. Schedule of Required Inspections and Tests:
   1. Inspection of foundation bearing surfaces including placement and compaction of any structural fill.
   2. Rebar placement and all concrete construction.
   3. Structural steel field welding.
   4. Placement of concrete.

D. Testing agency shall confirm current qualifications of each field welder.

3.09 SIGNAGE SCHEDULE AND LOCATION PLAN

A. Refer to Drawings.

END OF SECTION

SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Corner guards.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for Steel angle corner guards.
2. Section 057300 "Decorative Metal Railings" for metal handrails without plastic bumpers.
3. Section 064023 "Interior Architectural Woodwork for solid-wood handrails, bumper rails, chair rails, or corner moldings without plastic bumpers.
4. Section 087100 "Door Hardware" for metal and plastic protective trim units, according to BHMA A156.6, used for armor, kick, mop, and push plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.

B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.

C. Shop Drawings: For each type of wall and door protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

D. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.

1. Include Samples of accent strips and accessories to verify color selection.

E. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Wall Guards: 12 inches long. Include examples of joinery, corners, [end caps,][top caps,] and field splices.
2. Handrails: 12 inches long. Include examples of joinery, corners, and field splices.
3. Bed Locators: 12 inches long. Include example of end caps.
4. Corner and End-Wall Guards: 12 inches long. Include example top caps.
5. Abuse-Resistant Wall Covering: 6 by 6 inches square.
6. Door-Surface Protection: 6 by 6 inches square.
7. Door-Edge and Frame Protectors: 12 inches long.
8. Door-Knob and -Lever Protectors: Full-size unit of each type.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of handrail.

B. Material Certificates: For each type of exposed plastic material.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.5 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. Wall-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 96-inch- long units.
2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch-long units.
3. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.6 QUALITY ASSURANCE

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

a. Store corner-guard covers in a vertical position.
b. Store wall-guard covers in a horizontal position.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period: [Five]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.3 CORNER GUARDS

A. Surface-Mounted, Opaque-Plastic Corner Guards: Fabricated as one piece from PVC plastic with formed edges; fabricated with 90- or 135-degree turn to match wall condition.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. [American Floor Products Company, Inc]
b. [Babcock-Davis]
c. [Construction Specialties, Inc.]
d. [inpro Corporation]
e. [JL Industries; Activar Construction Products Group, Inc.]
f. [Koroseal Interior Products, LLC]
g. [The R.C. Musson Rubber Co.]
h. [WallGuard.com]
i. [Wallprotex]

2. Wing Size: Nominal 2-1/2 by 2-1/2 inches.
3. Mounting: Adhesive.
4. Color and Texture: Match Existing.

2.4 MATERIALS

A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.

B. Polycarbonate Plastic Sheet: ASTM D6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. of notch when tested according to ASTM D256, Test Method A.

C. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.

D. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

E. Adhesive: As recommended by protection product manufacturer.

2.5 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Curved Panels: Preform curved semirigid, abuse-resistant sheet wall covering in factory for radius and sheet thickness as follows:

1. Sheet Thickness of 0.040 Inch: 24-inch radius.
2. Sheet Thickness of 0.060 Inch: 36-inch radius.

C. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

D. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

E. Wood Handrails: Miter corners and ends of wood handrails for returns.

2.6 FINISHES

A. Protect 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 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.

C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.
2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
3. Adjust end and top caps as required to ensure tight seams.

D. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

E. Door-Frame Protectors: Install on both door jams.

F. Fire Doors: Install protection according to the listing of each item.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Custodial accessories.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: Five years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Toilet-Compartment Occupancy-Indicator Systems: Manufacturer agrees to repair or replace toilet-compartment occupancy-indicator systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue (Roll) Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Bobrick Washroom Equipment, Inc

2. Description: Model B-3888 Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
3. Mounting: Recessed
4. Operation: Noncontrolled delivery with theft-resistant spindles.

5. Capacity: Designed for [4-1/2- or 5-inch] diameter tissue rolls.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

B. Combination Toilet Tissue Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Bobrick Washroom Equipment, Inc

2. Description: Combination unit with double-roll toilet tissue dispenser and the following:

    a. Removable sanitary-napkin waste receptacle with self-closing, disposal-opening cover.
    b. Seat-cover dispenser with minimum capacity of 500 single or half-fold seat covers.

3. Mounting: Recessed.
4. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch diameter tissue rolls.
5. Toilet Tissue Dispenser Operation: Noncontrolled delivery with theft-resistant spindles.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
7. Lockset: Tumbler type.

C. Combination Towel (Roll) Dispenser/Waste Receptacle:

1. Manufacturers: Subject to compliance with requirements, provide products by the following

    a. Bobrick Washroom Equipment, Inc

2. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle.
3. Towel Mechanism: Pull towel
4. Mounting: Recessed
5. Minimum Towel-Dispenser Capacity: 8-inch- wide, 800-foot- long roll
6. Minimum Waste Receptacle Capacity: 12 gal.
7. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin)
8. Liner: Reusable, vinyl waste-receptacle liner
9. Lockset: Tumbler type for towel dispenser compartment and waste receptacle.

D. Warm-Air Hand Dryer:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    a. Bobrick Washroom Equipment, Inc

2. Description: Standard-speed, warm-air hand dryer.

3. Mounting: Recessed.
4. Operation: Infrared-sensor activated with timed power cutoff switch.
   a. Automatic Shutoff: At 40 seconds.
5. Maximum Sound Level: 63 dB.
6. Cover Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
7. Electrical Requirements: 115 V, 20 A, 2300 W.

E. Soap Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Bobrick Washroom Equipment, Inc
2. Basis of Design: Bobrick American Specialties 0347
3. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
4. Mounting: Vertically oriented, surface mounted.
5. Capacity: 40oz.
6. Materials: Stainless Steel
7. Lockset: Tumbler type.
8. Refill Indicator: Window type.

F. Recessed Toilet-Seat-Cover Dispenser, Waste Disposal and Toilet Tissue Dispenser Units:

1. Basis of Design: Bobrick Classic Series Model B-3574.

   a. ADA Compliance:

      1) Unit mounts flush against side wall in accessible toilet compartment to allow clearance for horizontal grab bar across front of unit and installation of 18 inch (460mm) vertical grab bar (ICC/ANSI A117.1-2009).
      2) Unit has toilet tissue dispensers on right side for installation in accessible toilet compartment on left side of toilet (when seated on toilet).

2. Basis of Design: Bobrick Classic Series Model B-35745.

   a. ADA Compliance:

      1) Unit mounts flush against side wall in accessible toilet compartment to allow clearance for horizontal grab bar across front of unit and installation of 18 inch (460mm) vertical grab bar (ICC/ANSI A117.1-2009).
      2) Flush side of unit has toilet tissue dispensers on left side for installation in accessible toilet compartment on right side of toilet (when seated on toilet).

3. Cabinet: All welded, 18-8, Type 304, heavy gauge stainless steel with satin finish on exposed surfaces.
4. Flange: Drawn and beveled, one-piece, seamless, 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish.
5. Door: One-piece, seamless, 18-8, Type 304, 18 gauge (1.2mm) stainless steel with satin finish; with two tumbler locks keyed like other washroom accessories.
6. Hinge: Full-length stainless steel piano-hinge.
7. Disposal Panel: 18-8, Type 304, 22 gauge (0.8mm) stainless steel push door with hemmed edges and satin finish on exposed surfaces; secured to cabinet with spring-loaded, full-length stainless steel piano-hinge. Equipped with international graphic symbols identifying napkin disposal.
8. Waste Receptacle: Leak-proof molded polyethylene, removable for servicing. Capacity 0.8 gallons (3.0 L).
9. Toilet Tissue Dispensers (2): 0.100 inch (2.5mm) thick ABS plastic; with theft-resistant, heavy-duty, one-piece, molded ABS plastic spindles; rolls removable from cabinet only when door is open.
10. Toilet Tissue Capacity: Unit holds two standard-core toilet tissue rolls up to 5-1/4 inch (135mm) diameter (1800 sheets).
11. Seat-Cover Capacity: 500 paper toilet-seat-covers

G. Grab Bar:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Bobrick Washroom Equipment, Inc
2. Basis of Design: Bobrick Model B-6806 x 36
3. Mounting: Flanges with concealed fasteners.
4. Material: Stainless steel, 0.05 inch thick.
   a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
5. OD: 1-1/4 inches.
6. Configuration and Length: As indicated on Drawings.

H. Sanitary-Napkin Disposal Unit:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Bobrick Washroom Equipment, Inc
2. Basis of Design: Bobrick Model B-353
3. Mounting: Recessed.
4. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
5. Receptacle: Removable.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

I. Seat-Cover Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by

the following:
a. Bobrick Washroom Equipment, Inc
2. Basis of Design: Bobrick Classic B-301
3. Mounting: Recessed.
4. Minimum Capacity: 500 seat covers.
5. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
6. Lockset: Tumbler type.

J. Folding Shower Seats:
1. Basis of Design: Bobrick Model B-517.
a. Configuration: Right-hand seat.
2. Basis of Design: Bobrick Model B-518.
a. Configuration: Left-hand seat.
3. Compliance: Universal/accessibility design, including ADA-ABA and ICC/ANSI. for structural strength; clearance between back of shower seat and wall is 1-1/2 inches (38mm).
4. Capacity: Designed to support 360 lbs (163 kg) in compliant installations.
5. Seat: 2 inches (51mm) overall thickness, comprised of 1-1/2 inch (38mm) thick, closed-cell polyurethane foam padding mounted on 1/2 inch (13mm) thick plywood; covered in white naugahyde (water-resistant, reinforced vinyl fabric). Folds against wall when not in use.
6. Seat Supports: Do not come into contact with floor.
7. Frame: 18-8, Type 304 stainless steel with satin finish; 16 gauge (1.6mm), 1-1/4 inch (32mm) square members, 18 gauge (1.2mm), 1 inch (25mm) diameter tubing.
8. Mounting Flanges: 18-8, Type 304, 3/16 inch (5mm) thick stainless steel with satin finish; 3 inch (76mm) diameter with three mounting screw holes.
9. Baseplate: 18-8, Type 304, heavy gauge stainless steel.
10. Spring: 17-7, Type 301, 24 gauge (0.6mm) stainless steel, spot-welded to baseplate. Holds seat against wall.
11. Guide Bracket: 18-8, Type 304, 16 gauge (1.6mm) stainless steel with satin finish.

K. Mirror Unit:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. Bobrick Washroom Equipment, Inc
2. Basis of Design: Bobrick B-290 2430
3. Frame: Stainless steel angle, 0.05 inch thick.
a. Corners: Manufacturer's standard.
4. Size: As indicated on Drawings.
5. Shelf:
a. Type: Integral, welded.
b. Depth: 5 inches

6. Hangers: Manufacturer's standard rigid, tamper and theft resistant

L. Hook:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Bobrick Washroom Equipment, Inc
2. Description: Combination hat and coat hook.
3. Mounting: Concealed.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 7 finish (polished).

2.3 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Custodial Mop and Broom Holder:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Bobrick Washroom Equipment, Inc
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
   a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
   b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.4 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch- minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of [six]<Insert number> keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION OF TOILET, BATH, AND LAUNDRY ACCESSORIES

A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 10 41 00 - EMERGENCY ACCESS AND INFORMATION CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 00 and 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Emergency lock box.

B. Related Sections:
   1. Division 26 and 28 Section for coordination of power and alarm system connections.

1.03 SUBMITTALS

A. Shop Drawings: Submit plans, sections and details as required for attachment to structure/substrate. Show assembled unit and anchorage to structural members.
   1. Product Data: Submit copies of manufacturer's specifications and installation instructions.

PART 2 - PRODUCTS

2.01 RECESSED-MOUNTED EMERGENCY LOCK BOX

A. Basis-of-Design Product: Subject to compliance with requirements, provide Knox; Model 3200 Series Hinged Door Model with alarm tamper switch, or approved.
   1. Recessed Mounting Kit (RMK).
   2. U.L. listed box and lock.
   3. Finish: Manufacturer's standard finishing process.
      a. Color: Black.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer’s installation instructions. Install in locations indicated.

B. Coordinate installation for backing and blocking for attachment to building structure.

C. Corrections: Repair or replace damaged unit or components as directed by Architect. Verify that unit is properly installed and functioning. Take necessary steps to correct operational deficiency.

END OF SECTION

SECTION 10 44 13 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Fire protection cabinets for the following:
      a. Portable fire extinguishers.

B. Related Sections:
   1. Division 10 Section "Signage" for directional signage to out-of-sight fire extinguishers and cabinets.
   2. Division 10 Section "Fire Extinguishers."

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
   1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, and cabinet type, trim style, and panel style.
   2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

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. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:
   a. Schedules and coordination requirements.

1.05 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.02 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. J. L. Industries, Inc., a division of Activar Construction Products Group;
      b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
      c. Larsen's Manufacturing Company.
      d. Watrous Division, American Specialties, Inc.

B. Cabinet Construction: Nonrated and 1-hour fire rated.
   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Steel sheet.

D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
   1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim. Provide where walls are of insufficient depth for semirecessed cabinet installation.

F. Cabinet Trim Material: Steel sheet.

G. Door Material: Steel sheet.

H. Door Style: Vertical duo panel with frame.

I. Door Glazing: Tempered break glass or Acrylic sheet.
   1. Acrylic Sheet Color: Clear transparent acrylic sheet.

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide projecting lever handle with cam-action latch.
   2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Accessories:
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
   3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
      a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
         1) Location: Applied to cabinet door.
         2) Application Process: Decals.
         3) Lettering Color: Red.
         4) Orientation: Vertical.

L. Finishes:
   1. Manufacturer's standard baked-enamel paint for the following:
      a. Exterior of cabinet door, and trim except for those surfaces indicated to receive another finish.
      b. Interior of cabinet and door.
   2. Steel: Baked enamel or powder coat.

2.03 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
   1. Weld joints and grind smooth.
   2. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
   1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
   2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.04 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. 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.

2.05 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning".

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
   1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare recesses for semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below, or at heights acceptable to authorities having jurisdiction.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Provide inside latch and lock for break-glass panels.
   2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. Identification: Apply decals at locations indicated.

3.04 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturers written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections:
   1. Division 10 Section "Fire Extinguisher Cabinets."
   2. Division 21 Sections for Wet and Dry Fire Sprinkler systems.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

C. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FMG.

C. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
      a. Schedules and coordination requirements.

1.05 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Amerex Corporation.
      b. Ansul Incorporated; Tyco International Ltd.
      c. Badger Fire Protection; a Kidde company.
      d. J. L. Industries, Inc.; a division of Activar Construction Products Group.
      e. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
      f. Larsen's Manufacturing Company.
   2. Handles and Levers: Manufacturer's standard.
   3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Type A: Multipurpose Dry-Chemical Type in Steel Container: UL-rated 3-A: 40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

C. Type B: Class-K Wet Chemical Type in Stainless Steel Container: UL-rated 2-A:K, 20-lb nominal capacity, with potassium bicarbonate-based wet chemical in stainless steel container.

2.02 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Amerex Corporation.
      b. Ansul Incorporated; Tyco International Ltd.
      c. Badger Fire Protection; a Kidde company.
      d. J. L. Industries, Inc.; a division of Activar Construction Products Group.
      e. Larsen's Manufacturing Company.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
      a. Orientation: Vertical.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated on plan and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
   2. Install fire extinguishers in cabinets specified in Division 10 Section "Fire Extinguisher Cabinets" as indicated on Drawings.

B. Locations: As indicated on Drawings.

END OF SECTION

SECTION 323300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bicycle racks.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for [installing pipe sleeves cast][installing anchor bolts cast][formed voids] in concrete footings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Initial Selection: For units with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.

1. Include full-size Samples of bicycle rack. Approved samples may be incorporated into the Work.

F. Product Schedule: For site furnishings.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For site furnishings manufactured with preservative-treated wood.

1. Indicate type of preservative used and net amount of preservative retained.[For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.]

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Bench Replacement [Slats][Planks]: No fewer than [two]<Insert number> full-size units for each size indicated.
2. Trash Receptacle Inner Containers: [Five]<Insert number> full-size units for each size indicated, but no fewer than [two]<Insert number> units.
3. Anchors: <Insert type and number>.

PART 2 - PRODUCTS

2.1 BICYCLE RACKS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Ground Control Systems

B. Bicycle Rack Construction:

1. Frame: Steel.

a. [Tubing] OD: 1.9” HSS

2. Style: [Double-sided parking

a. Overall Height: 32-3/8”
b. Overall Width: 24-1/2”
c. Overall Depth: 1.90”
d. Capacity: Designed to accommodate no fewer than [two] bicycles.

3. Security: Designed to lock [frame].
4. Accessories: [Base covers for each pipe and tubing anchored end].
5. Installation Method: Surface flange anchored at finished grade to substrate indicated

C. Steel Finish: Color coated.

1. Color: [Black Polyester Powder Coat]

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B211.
2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B221.
3. Structural Pipe and Tube: ASTM B429/B429M.
4. Sheet and Plate: ASTM B209.
5. Castings: ASTM B26/B26M.

B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A36/A36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A53/A53M, or electric-resistance-welded pipe complying with ASTM A135/A135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A500/A500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A513/A513M, or steel tubing fabricated from steel complying with ASTM A1011/A1011M and complying with dimensional tolerances in ASTM A500/A500M; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A1011/A1011M.

C. Anchors, Fasteners, Fittings, and Hardware: [Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials]

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to [on]-grade substrate; [one per leg].
2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; [two per unit]

D. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
2. Hot-Dip Galvanizing: According to ASTM A123/A123M, ASTM A153/A153M, or ASTM A924/A924M.

2.3 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.

E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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.

2.5 STEEL AND GALVANIZED-STEEL FINISHES

A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and [securely anchored] at locations indicated on Drawings.

END OF SECTION

SECTION 10 73 13 - AWNINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed awnings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, and finishes for awnings.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, mounting heights, and attachment details.
2. Detail fabrication and assembly of awnings.
3. Include diagrams for power, signal, and control wiring.
4. Show locations for blocking, reinforcement, and supplementary structural support.
5. Graphics: Show text message, font, character sizes, and other graphic forms; character, word, and line spacing; margin widths; position of copy; and other information related to graphic design.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Verification: For the following:

1. Seam, Edge, and Corner Condition: Not less than 12-inch- long section showing seam, edge, and corner treatment.
2. Valance: Full-size unit, not less than 12 inches long.
3. Frame Finish: Not less than 6-inch lengths.

E. Product Schedule: For awnings. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For awnings to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 WARRANTY

A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of awnings that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including framework.
b. Deterioration of fabric including seam failure.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Faulty operation of operator.

2. Awning Warranty Period: Five years from date of Substantial Completion.
3. Graphics Warranty Period: Outdoor durability not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design: Design awnings, including comprehensive engineering analysis by a qualified engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Awnings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of awning components and mounting brackets, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on a uniform pressure of 30 lb./sq. ft. (1435 Pa), acting perpendicular to awning surfaces.

C. Thermal Movements: Provide awning system that allows for thermal movements resulting from a maximum change in ambient and surface temperature as indicated without buckling, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Range: 120° F (49° C) ambient and 180° F (82° C) at material surfaces.

2.2 FIXED, EXTRUDED-ALUMINUM AWNINGS

A. Solid Panel Drainable Metal Awning

1. Basis-of-Design Product: Architectural Louvers Co. (Harray, LLC); Model H8CV. Subject to compliance with requirements, provide the specified product or comparable product by one of the following:

a. Manufacturers of equivalent products submitted and approved in accordance with Section 01 25 00 - Product Substitution Procedures.

2. Frame Depth: 8 inches (204 mm)
3. Trim Profile: Rectangular tube
4. Panel Type: Interlocking ribbed extrusions
5. Siding Option: Single sided (bottom panel only)
6. Drainage: Provide perimeter and intermediate gutters of sufficient capacity to allow for proper drainage. Provide water diverters at outlets.
7. Outrigger Thickness: Not less than 0.125 inch (2.54 mm) for structural shapes, not less than 0.25 inch (6.35 mm) for flat materials.
8. Frame and Panel Nominal Thickness: Not less than 0.080 inch (2.03 mm).

2.3 ALUMINUM FINISHES

A. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, operational clearances, accurate locations of connections to building electrical system, lighting, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and mount awnings level, plumb, and at indicated alignment with adjacent work.

B. Use fastening and mounting methods in accordance with manufacturer instructions.

C. Use concealed anchorages where possible, with locations as directed by manufacturer instructions.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and unfinished nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, and lubricate as recommended by retractable-awning manufacturer.

3.4 CLEANING AND PROTECTION

A. Touch up factory-applied finishes to restore damaged or soiled areas.

B. Galvanized Surfaces: Clean field welds, connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 220523 - General-Duty Valves for Plumbing Piping.

B. Section 220719 - Plumbing Piping Insulation.

1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

1.03 SUBMITTALS

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

1.04 QUALITY ASSURANCE

A. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.06 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.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Manufacturers:
   1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.

C. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

C. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Applications.

B. General requirements.

C. Angle valves.

D. Ball valves.

E. Check valves.

1.02 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels.

B. Section 220553 - Identification for Plumbing Piping and Equipment.

C. Section 220719 - Plumbing Piping Insulation.

D. Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

E. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings; 2015 (Reapproved 2021).

F. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

G. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

H. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

I. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

J. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

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

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.

b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball, _____.

C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

D. Domestic, Hot and Cold Water Valves:
   1. 2 inch (50 mm, DN) and Smaller:
      a. Bronze and Brass: Provide with solder-joint ends.
      b. Bronze Angle: Class 125, bronze disc.
      c. Ball: One piece, full port, brass with brass trim.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller except plug valves.

D. Insulated Piping Valves: With 2 inch (50 mm, DN) stem extensions and the following features:
   1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:
   1. Threaded End Valves: ASME B1.20.1.
   2. Solder Joint Connections: ASME B16.18.

F. General ASME Compliance:
   1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
   2. Solder-joint Connections: ASME B16.18.

G. Potable Water Use:
   1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
   2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

2.03 BRONZE, ANGLE VALVES

A. Class 125: CWP Rating: 200 psig: (1380 kPa).
   1. Comply with MSS SP-80, Type 1.
   2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
   3. End Connections: Pipe thread.
   4. Stem: Bronze.
   5. Disc: Bronze.
   6. Packing: Asbestos free.
   7. Handwheel: Bronze or aluminum.

2.04 BRASS, BALL VALVES

A. Two Piece, Full Port with Brass Trim:
   1. Comply with MSS SP-110.
   2. WSP Rating: 150 psi (1,035 kPa).
   3. WOG Rating: 600 psi (4,140 kPa).

4. Body: Forged brass.
5. Ends: Threaded.
6. Seats: PTFE.

2.05 BRONZE, BALL VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Regular Port with Bronze Trim:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi (1,035 kPa).
3. WOG Rating: 600 psi (4,140 kPa).
4. Body: Forged bronze or dezincified-brass alloy.
5. Ends Connections: Pipe thread or solder.
6. Seats: PTFE.

2.06 STAINLESS STEEL, BALL VALVES

A. Two Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi (1,035 kPa).
3. CWP Rating: 2,000 psi (13,790 kPa).
4. Body: Stainless steel.
5. Ends: Threaded or press.
6. Seats: PFTE.
7. Stem: Stainless steel, blowout proof.
8. Ball: Stainless steel, vented.
9. End Connections: Threaded.
10. Operator: Lockable handle.

2.07 BRONZE, LIFT CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.
2. CWP Rating: 200 psi (1,380 kPa).
3. Design: Vertical flow.
4. Body: Comply with ASTM B61 or ASTM B62, bronze.
5. End Connections: Threaded.
6. Disc (Type 1): Bronze.

2.08 BRONZE, SWING CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125: CWP Rating: 200 psig (1380 kPa).
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. Body: Bronze, ASTM B62.
4. End Connections: Threaded.
5. Disc: Bronze.
6. Manufacturers:

a. Apollo Valves; _____: www.apollovalves.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
1. Lift Check: Install with stem plumb and vertical.
2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe hangers.

B. Pipe supports, guides, shields, and saddles.

C. Seismic bracing hardware.

D. Retrofit piping cover system.

E. Anchors and fasteners.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

M. FM (AG) - FM Approval Guide; current edition.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

O. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

C. Installer's Qualifications: Include evidence of compliance with specified requirements.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.04 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Materials for Metal Fabricated Supports: Comply with Section 055000.
   1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
   2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.02 PIPE HANGERS

A. Band Hangers, Adjustable:
   1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

B. Swivel Ring Hangers, Adjustable:
   1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
   2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

C. Clevis Hangers, Adjustable:

2.03 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Pipe Supports:
   1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   2. Liquid Temperatures Up to 122 degrees F (50 degrees C):
      a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
      b. Support From Below: MSS SP-58 types 35 through 38.

C. Pipe Supports, Thermal Insulated:
   1. General Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      c. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
      d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
   2. PVC Jacket:
      a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.

b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
c. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).

2.04 SEISMIC BRACING HARDWARE

A. Cable Sway Bracing Systems:
1. Cable wire hanger with fix and release spring mechanism enclosed using zinc housing with 302 stainless steel components for pipe or equipment suspension to surface-mounted end-fixing fittings.
2. Provide cable wire and end-fixing as required to hold minimum weight of 25 lb (11.3 kg).

2.05 ANCHORS AND FASTENERS

A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

D. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
1. Channel Material: Use galvanized steel.
2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.03 SUBMITTALS

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

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:
   1. Control panels, transducers, and other related control equipment products.
   2. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:
   1. Piping: 3/4 inch (20 mm) diameter and smaller.

C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

2.02 NAMEPLATES

A. Manufacturers:
   1. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
   2. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
   3. Seton Identification Products; _____: www.seton.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Description: Laminated piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch (6 mm).
   3. Background Color: Black.
   4. Nameplate Height: 3/4 inch (19 mm).
   5. Nameplate Material:
      a. Flexible: Vinyl with adhesive backing per ASTM D709.
      b. Metal: Brass with center-side holes for screw fastening.

2.03 TAGS

A. Manufacturers:
   1. Advanced Graphic Engraving; _____: www.advancedgraphicengraving.com/#sle.
   2. Brady Corporation; _____: www.bradycorp.com/#sle.
   3. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
   4. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
   5. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
   6. Seton Identification Products; _____: www.seton.com/#sle.
   7. Substitutions: See Section 016000 - Product Requirements.

2.04 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation; _____: www.bradycorp.com/#sle.
   2. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.

3. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
4. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
5. Seton Identification Products; _____: www.seton.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install tags in clear view and align with axis of piping

B. Install plastic pipe markers in accordance with manufacturer's instructions.

C. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

END OF SECTION

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cellular glass insulation.

B. Expanded polystyrene insulation.

C. Flexible elastomeric cellular insulation.

D. Glass fiber insulation.

E. Polyethylene insulation.

F. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).

F. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

G. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

H. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

I. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

J. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

K. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

M. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

A. Manufacturers:
   1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
   2. Johns Manville Corporation; _____: www.jm.com/#sle.
   3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
   5. Owens Corning Corporation; VaporWick Pipe Insulation: www.ocbuildingspec.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
   2. Maximum Service Temperature: 220 degrees F (104 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

D. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 650 degrees F (343 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

E. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).

F. Vapor Barrier Lap Adhesive: Compatible with insulation.

G. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

H. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

I. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J. Insulating Cement: ASTM C449.

2.03 CELLULAR GLASS INSULATION

A. Insulation: ASTM C552, Type II, Grade 6.
   1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).

2. Service Temperature Range: From 250 degrees F (121 degrees C) to 800 degrees F (427 degrees C).
3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/(Pa s m)) maximum per inch.
4. Water Absorption: 0.5 percent by volume, maximum.

2.04 EXPANDED POLYSTYRENE INSULATION

A. Insulation: ASTM C578; rigid closed cell.
1. K (Ksi) Value: 0.23 at 75 degrees F (0.033 at 24 degrees C).
2. Maximum Service Temperature: 165 degrees F (74 degrees C).
3. Maximum Water Vapor Permeance: 5.0 perm inch (287 ng/(Pa s m)).

2.05 POLYETHYLENE INSULATION

A. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
1. K (Ksi) Value: ASTM C177; 0.25 at 75 degrees F (0.036 at 24 degrees C).
2. Maximum Service Temperature: 200 degrees F (93 degrees C).
3. Density: 2 pcf (32 kg/cu m).
4. Maximum Moisture Absorption: 1.0 percent by volume.
5. Moisture Vapor Permeability: 0.05 perm inch (0.073 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
6. Connection: Contact adhesive.

2.06 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
1. Aeroflex USA, Inc; Aerocel Stay-Seal with Protape (SSPT): www.aeroflexusa.com/#sle.
2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
3. K-Flex USA LLC; Insul-Tube: www.kflexusa.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
2. Maximum Service Temperature: 220 degrees F (104 degrees C).
3. Connection: Waterproof vapor barrier adhesive.

2.07 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
b. Maximum Service Temperature: 150 degrees F (66 degrees C).
c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil, 0.010 inch (0.25 mm).
e. Connections: Brush on welding adhesive.
2. Covering Adhesive Mastic: Compatible with insulation.

B. ABS Plastic Jacket:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
b. Maximum Service Temperature: 180 degrees F (82 degrees C).
c. Moisture Vapor Permeability: 0.012 perm inch (0.018 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
d. Thickness: 30 mil, 0.03 inch (0.75 mm).
e. Connections: Brush on welding adhesive.

C. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.

D. Aluminum Jacket:
   1. Thickness: 0.016 inch (0.40 mm) sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   4. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
   5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

E. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
   1. Thickness: 0.010 inch (0.25 mm).
   2. Finish: Smooth.
   3. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.

I. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

J. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

K. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply: Insulate all, thickness as per applicable codes
   2. Domestic Hot Water Recirculation: Insulate all, thickness as per applicable codes
   3. Domestic Cold Water: Insulate all, thickness as per domestic hot water supply

END OF SECTION

SECTION 221005 - PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, buried beyond 5 feet (1500 mm) of building.

B. Sanitary waste piping, buried within 5 feet (1500 mm) of building.

C. Sanitary waste piping, above grade.

D. Domestic water piping, buried beyond 5 feet (1500 mm) of building.

E. Domestic water piping, buried within 5 feet (1500 mm) of building.

F. Domestic water piping, above grade.

G. Storm drainage piping, buried within 5 feet (1500 mm) of building.
   1. Storm drainage piping, above grade.
   2. Natural gas piping, buried within 5 feet (1500 mm) of building.
   3. Pipe flanges, unions, and couplings.
   4. Pipe hangers and supports.
   5. Ball valves.
   6. Butterfly valves.
   7. Balancing valves.
   8. Pressure reducing valves.
   9. Pressure relief valves.
   10. Strainers.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 083100 - Access Doors and Panels.

C. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment.

D. Section 220553 - Identification for Plumbing Piping and Equipment.

E. Section 220719 - Plumbing Piping Insulation.

F. Section 312316.13 - Trenching.

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

B. ANSI Z223.1 - National Fuel Gas Code; 2015.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

F. ASME B31.1 - Power Piping; 2014.

G. ASME B31.9 - Building Services Piping; 2020.

H. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023, with Errata (2024).

I. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.

J. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

K. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

L. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

M. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

N. ASTM B32 - Standard Specification for Solder Metal; 2020.

O. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

P. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

Q. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

R. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

S. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.

T. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

U. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

V. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2022.

W. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

X. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.

Y. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

Z. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.

AA. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

BB. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core; 2023.

CC. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2024.

DD. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2024.

EE. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2023b.

FF. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

GG. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

HH. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.

II. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2024.

JJ. AWWA C606 - Grooved and Shouldered Joints; 2022.

KK. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

LL. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

MM. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

NN. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

OO. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

PP. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

QQ. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

RR. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

SS. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

TT. NSF 372 - Drinking Water System Components - Lead Content; 2022.

UU. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.

VV. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Product Data: Provide information for all piping systems.

D. Shop Drawings: All Plumbing Systems
   1. Fabrication, assembly and installation, including plans, elevations, sections, components and attachments to other work.
   2. Pipes and fittings.
   3. Piping layout indicating sizes, configuration, and insulation material.
   4. Elevation of top of pipes.
   5. Dimensions of all piping mains from building grid lines.
   6. Fittings.
   7. Penetrations through fire-rated and other partitions.
   8. Equipment installation based on equipment being used on Project.
   9. Locations for all piping accessories.
   10. Hangers and supports, including methods for piping and building attachment, seismic restraints and vibration isolation.

E. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. ABS Pipe: ASTM F628.
   1. Fittings: ABS.
   2. Joints: Solvent welded with ASTM D2235 cement.

2.03 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

C. ABS Pipe: ASTM F628.
   1. Fittings: ABS.
   2. Joints: Solvent welded with ASTM D2235 cement.

2.04 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.05 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

A. Ductile Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110/A21.10, ductile or gray iron, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket with 3/4-inch (19 mm) diameter rods.

B. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2.06 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
   1. Manufacturers:
      a. Uponor, Inc: www.uponorengineering.com/sle.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. PPI TR-4 Pressure Design Basis:

a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
b. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
c. 80 psig (551 kPa) at maximum 200 degrees F (93 degrees C).

3. Fittings: Brass and copper.
4. Fittings: Brass and engineered polymer (EP) ASTM F1960.
5. Joints: Mechanical compression fittings.
6. Joints: ASTM F1960 cold-expansion fittings.

2.07 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.

B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
1. Manufacturers:
a. Uponor, Inc: www.uponorengineering.com/sle.
b. Viega LLC: www.viega.com.
c. Zurn Industries, LLC: www.zurn.com.
d. Substitutions: See Section 016000 - Product Requirements.
2. PPI TR-4 Pressure Design Basis:
a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
b. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
c. 80 psig (551 kPa) at maximum 200 degrees F (93 degrees C).
3. Fittings: Brass and copper.
4. Fittings: Brass and engineered polymer (EP) ASTM F1960.
5. Joints: Mechanical compression fittings.
6. Joints: ASTM F1960 cold-expansion fittings.

2.08 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
1. Fittings: Cast iron.
2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe: ASTM D2665 or ASTM D3034.
1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.09 STORM DRAINAGE PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D2665.
1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.10 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
2. Joints: Threaded or welded to ASME B31.1.

2.11 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:

1. Ferrous Pipe: Class 150 malleable iron threaded unions.
2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or _____, galvanized.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

C. No-Hub Couplings:
1. Testing: In accordance with ASTM C1277 and CISPI 310.
2. Gasket Material: Neoprene complying with ASTM C564.
3. Band Material: Stainless steel.
4. Eyelet Material: Stainless steel.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.12 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.

C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.
6. Other Types: As required.

2.13 BALL VALVES

A. Manufacturers:
1. Grinnell Products, a Tyco Business: www.grinnell.com.
2. Nibco, Inc: www.nibco.com.
3. Uponor, Inc: www.uponorengineering.com/sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.14 PIPING SPECIALTIES

A. Flow Controls:
   1. Manufacturers:
      a. ITT Bell & Gossett: www.bellgossett.com.
      b. Griswold Controls: www.griswoldcontrols.com.
      c. Taco, Inc: www.taco-hvac.com.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
   3. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

B. PRESSURE REDUCING VALVES
   1. Manufacturers:
      a. Amtrol Inc: www.amtrol.com.
      b. Cla-Val Company: www.cla-val.com.
      c. Watts Regulator Company: www.wattsregulator.com.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. 2 inch (50 mm, DN) and Smaller:
      a. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
      b. Pressure Reducing Pilot-Operator:
         1) Operating Range: 5 to 50 psi (0.35 to 35 Bar).
         2) Connected into brass or bronze pilot piping and fittings.
         3) Fixed flow restrictor, pressure gauges, and isolation valves.
   3. 2 inch (50 mm, DN) and Larger:
      a. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
      b. Pressure Reducing Pilot-Operator:
         1) Operating Range: 5 to 50 psi (0.35 to 35 Bar).
         2) Connected into brass or bronze pilot piping and fittings.
         3) Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

C. PRESSURE RELIEF VALVES
   1. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
   2. Temperature and Pressure:
      a. Manufacturers:
         1) Cla-Val Co: www.cla-val.com.
         2) Henry Technologies: www.henrytech.com.
         3) Watts Regulator Company: www.wattsregulator.com.
         4) Substitutions: See Section 016000 - Product Requirements.
      b. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME BPVC-IV certified and labelled.

D. STRAINERS
   1. Manufacturers:
      a. Armstrong International, Inc: www.armstronginternational.com.

b. Green Country Filter Manufacturing: www.greencountryfilter.com.
c. WEAMCO: www.weamco.com.
d. Substitutions: See Section 016000 - Product Requirements.

2. Size 2 inch (50 mm, DN) and Smaller:
   a. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
   b. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
3. Size 1-1/2 inch (40 mm, DN) to 4 inch (100 mm, DN):
   a. Class 125, flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain headroom, conserve space, and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

F. Provide access where valves and fittings are not exposed.
   1. Coordinate size and location of access doors with Section 083100.

G. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.

H. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

I. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

J. Sleeve pipes passing through partitions, walls, and floors.

K. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   4. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Provide spring-loaded check valves on discharge of water pumps.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

3.06 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.07 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
         1) Maximum Hanger Spacing: 6.5 ft (2 m).
         2) Hanger Rod Diameter: 3/8 inches (9 mm).
      b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).
      c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 1/2 inch (13 mm).
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft (1.8 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION

SECTION 221006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.
B. Cleanouts.
C. Hose bibbs.
D. Backflow preventers.
E. Double check valve assemblies.
F. Water hammer arrestors.
G. Sumps.
H. Sanitary waste interceptors.
I. Mixing valves.

1.02 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains; 2022.
B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.
C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.
D. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.
E. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.
F. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies; 2021.
G. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
H. ASSE 1048 - Performance Requirements for Double Check Detector Backflow Prevention Assemblies; 2021e.
I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
J. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
K. NSF 372 - Drinking Water System Components - Lead Content; 2022.
L. PDI-WH 201 - Water Hammer Arresters; 2017.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
D. Certificates: Certify that grease interceptors meet or exceed specified requirements.
E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
G. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, and water hammer arrestors.
H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 016000 - Product Requirements for additional provisions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Manufacturers:
   1. Acudor Platinum, a division of Acudor; _____: www.acudorplatinum.com/#sle.
   2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   3. Josam Company; _____: www.josam.com/#sle.
   4. Zurn Industries, LLC: www.zurn.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Roof Overflow Drains:
   1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 2 inches (51 mm) above flood elevation.

C. Area Drains:
   1. Assembly: ASME A112.6.4.
   2. Body: Lacquered cast iron with sump.
   3. Strainer: Round nickel-bronze.
   4. Accessories: Membrane flange and membrane clamp with integral gravel stop, with adjustable under deck clamp.

D. Linear Drains:
   1. Body: Provide PVC, ABS, or stainless-steel with sloped channel to vertical waste pipe.
   2. Clamping Ring: Stainless steel mechanism to clamp waterproof membrane to linear drain body.
   3. Strainer: Removable brushed stainless steel or tile top strainer furnished by manufacturer or others.
   4. Grate: Cross-hatch.
   5. Additional Components: Manufacturer's standard membrane, sealant, fasteners, and anchors.

E. Floor Drain (FD-1):
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.03 CLEANOUTS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   2. Josam Company: www.josam.com.
   3. Zurn Industries, LLC: www.zurn.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Cleanouts at Exterior Surfaced Areas (CO-1):
   1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas (CO-2):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas (CO-3):
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas (CO-4):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

F. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   2. Watts Regulator Company: www.wattsregulator.com.
   3. Zurn Industries, LLC: www.zurn.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Interior Hose Bibbs:
   1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome-plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

C. Interior Mixing Type Hose Bibbs:
   1. Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome-plated where exposed with handwheels, and vacuum breaker in compliance with ASSE 1011.

2.05 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Conbraco Industries, Inc: www.apollovalves.com.
   2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
   3. Zurn Industries, LLC: www.zurn.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Reduced Pressure Backflow Preventer Assembly:
   1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
   2. Size: _____ inch (_____ mm) assembly with threaded gate valves.

2.06 DOUBLE CHECK-VALVE ASSEMBLIES

A. Manufacturers:
   1. Conbraco Industries, Inc: www.apollovalves.com.
   2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
   3. Zurn Industries, LLC: www.zurn.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Double Check Valve Assembly:
   1. ASSE 1012; cast bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.
   2. Size: 3/4 to 2 inch, NPS (20 to 50 mm, DN) assembly with threaded full port ball valves.

2.07 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.

3. Zurn Industries, LLC: www.zurn.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.08 SUMPS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jrsmith.com.
2. Zurn Industries, LLC: www.zurn.com.
3. Substitutions: See Section 016000 - Product Requirements.

B. Precast concrete with required openings and drainage fittings.

C. Cover: 3/8 inch (9 mm) thick checkered steel plate with gasket seal frames and anchor bolts.

2.09 SANITARY WASTE INTERCEPTORS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jrsmith.com.
2. Zurn Industries, LLC: www.zurn.com.
3. Substitutions: See Section 016000 - Product Requirements.

B. Grease Interceptors:
1. Construction:
a. Material: Polyethylene.
b. Rough-in: Buried with risers to finished grade..
c. Accessories: Multi-weir baffle assembly, integral deep seal trap, removable integral flow control, sediment bucket.
d. Cover: Ductile iron, epoxy coated, non-skid with gasket, and securing handle.
2. Unit Rating: [CHOICE TEXT] flow and 1,751 lbs (_____ kg) grease capacity.

2.10 MIXING VALVES

A. Thermostatic Mixing Valves:
1. Manufacturers:
a. ESBE: www.esbe.se/en.
b. Honeywell International Inc: yourhome.honeywell.com.
c. Leonard Valve Company: www.leonardvalve.com.
d. Substitutions: See Section 016000 - Product Requirements.
2. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
3. Accessories:
a. Check valve on inlets.
b. Volume control shut-off valve on outlet.
c. Stem thermometer on outlet.
d. Strainer stop checks on inlets.
4. Cabinet: 16 gauge, 0.0598 inch (1.52 mm) prime-coated steel, for recessed mounting with keyed lock.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Pipe relief from backflow preventer to nearest drain.

F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.

END OF SECTION

SECTION 223000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial gas-fired water heaters.

B. Residential electric water heaters.

C. Tankless electric water heaters.

D. Diaphragm-type compression tanks.

E. Water filters.

F. Acid-effluent neutralizers.

G. In-line circulator pumps.

H. Submersible sump pumps.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

C. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

C. Shop Drawings:
   1. Indicate heat exchanger dimensions, size of tappings, and performance data.
   2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Project Record Documents: Record actual locations of components.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Certifications:
   1. Water Heaters: NSF approved.
   2. Electric Water Heaters: UL listed and labeled to UL 174.
   3. Water Tanks: ASME labeled to ASME BPVC-VIII-1.
   4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Manufacturers:
   1. A.O. Smith Water Products Co: www.hotwater.com.
   2. HTP: www.htproducts.com
   3. Rheem Manufacturing Company: www.rheem.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Commercial Gas Fired:
   1. Type: Automatic, natural gas-fired or propane fired, condensing tankless.
   2. Product: Unit shall be wall mounted and vented with PVC.
   3. Performance:
      a. Water heater(s) design certified to the ANSI Z21.10.3 standard for gas fired water heaters.
      b. Water Heater(s) shall be configured to operate with natural gas and a 120 volt/60 Hz AC power source.
      c. Water Heater(s) shall have a BTU input range of 15,000 BTU/hr to 199,000 BTU/hr, and a maximum hot water outlet capacity of 8.0 gallons per minute (with a 30 °F temperature rise).
      d. Water Heater(s) shall be microprocessor controlled and utilize a direct electronic ignition system (with no standing pilot), fully modulating gas control valve, turbine flow meter, automatic electro-mechanical water flow control valve, and water temperature thermistors to maintain outlet water temperature between ± 2 °F of set point temperature. Microprocessor shall have built in recirculation logic to control a pump's heating cycles.
      e. Water Heater(s) shall incorporate the following internal safety devices: flame failure lockout, boiling protection lockout, thermal overheat protection, internal freeze protection for ambient temperatures as low as – 4 °F, and lockout protection in the event of a blocked flue.
      f. Water Heater(s) shall be provided with a temperature thermostat with an adjustable set point range of 98 °F to 185 °F.
      g. Water Heater(s) shall also be capable of storing and displaying a history of up to 9 diagnostic maintenance codes, via the display on the temperature thermostat controller.
      h. Water Heater(s) shall have downward fired fiber mesh burners, solid brass water flow control valve, and solid brass inlet and outlet water connections.

C. Commercial Gas-Fired Water Heaters:
   1. Manufacturers:
      a. Bradford White Corporation; eF Series, Ultra High Efficiency Model: www.bradfordwhite.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Type: Automatic, natural gas-fired, tank type.
   3. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
   4. Performance:
      a. Storage Capacity: 100 gal (____ L).
      b. Minimum Recovery Rate: 235 gph (____ L/sec) with 100 degrees F (56 degrees C) temperature rise.

c. Maximum Working Pressure: 150 psig (1000 kPa).

5. Accessories:
   a. Water Connections: Brass.
   b. Dip Tube: Brass.
   c. Drain valve.
6. Controls: Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F (49 to 82 degrees C), automatic reset high temperature limiting thermostat factory set at 195 degrees F (90 degrees C), gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.

D. Residential Electric Water Heaters:
1. Type: Automatic, electric, vertical storage.
2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
3. Tank: Glass lined welded steel, thermally insulated with one inch (25 mm) thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.
4. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F (49 to 77 degrees C), flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.
5. Accessories:
   a. Water Connections: Brass.
   b. Dip Tube: Brass.
   c. Drain valve.
   d. Anode: Magnesium.
   e. Temperature and Pressure Relief Valve: ASME labeled.

E. Tankless Electric Water Heater:
1. Manufacturers:
   a. Bosch Thermotechnology; _____: www.bosch-thermotechnology.us/#sle.
   b. Bradford White Corporation; KwickShot: www.bradfordwhite.com/#sle.
   c. Chronomite, Inc; _____: www.chronomite.com/#sle.
   d. _____.
   e. Substitutions: See Section 016000 - Product Requirements.
2. Heater Type: Self-contained, wall-mounted unit capable of handling listed capacity, water-inlet strainer, removable thermally-insulated front panel, and threaded water pipe-end connections.
3. Heater-Heat Exchanger: Stainless steel, thermally insulated and encased assembly in corrosion-resistant steel jacket; baked-on enamel finish.
4. Safeties: Provide internal safeties for water flow, electrical load, and thermal load.
5. Controls: Color touchscreen interface for internal controls; temperature range adjustable from 120 to 170 degrees F (49 to 77 degrees C) using flanged or screw-in nichrome elements. Wire double-element units so elements do not operate simultaneously.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:
1. Amtrol Inc: www.amtrol.com.
2. Bell & Gossett, a xylem brand: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig (80 kPa).

2.03 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
   1. Armstrong Fluid Technology: www.armstrongfluidtechnology.com.
   2. Bell & Gossett, a xylem brand: www.bellgossett.com.
   3. Sterling SIHI GmbH: www.sterlingsihi.com.
   4. Grunfos Pumps.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Casing: Stainless Steel or Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.

C. Impeller: Stainless Steel or Bronze.

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

2.04 SUMP PUMPS

A. Manufacturers:
   1. Armstrong Fluid Technology: www.armstronfluidtechnology.com.
   2. Goulds Water Technology, a xylem brand: www.goulds.com.
   3. Zoeller Company: www.zoeller.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.05 ELECTRICAL WORK

A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.

B. Electrical characteristics to be as specified or indicated.

C. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.

D. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related electrical work to achieve operating system.

C. Domestic Water Storage Tanks:
   1. Provide steel pipe support, independent of building structural framing members.
   2. Clean and flush prior to delivery to site. Seal until pipe connections are made.

D. Pumps:
   1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
   2. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush valve water closets.

B. Tank type water closets.

C. Wall hung urinals.

D. Wall-hung, solid surface, multistation lavatory units.

E. Sinks.

F. Under-lavatory pipe supply covers.

G. Bathtubs and showers.

H. Showers.

I. Indoor drinking fountains.

J. Mop sinks.

K. Service sinks.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Owner-furnished fixtures.

B. Section 064100 - Architectural Wood Casework: Counters for sinks and lavatories.

C. Section 123600 - Countertops: Counters for sinks and lavatories.

D. Section 221005 - Plumbing Piping.

E. Section 223000 - Plumbing Equipment.

F. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2024.

B. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

C. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

D. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

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

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, wall hung, siphon jet flush action, china bolt caps.
   1. Bowl: ASME A112.19.2; 16.5 inches (420 mm) high with elongated rim.
   2. Flush Valve: Exposed (top spud).
   3. Flush Operation: Sensor operated.
   4. Handle Height: 44 inches (1117 mm) or less.
   5. Inlet Size: 1-1/2 inches (38 mm).
   6. Manufacturers:
      a. American Standard, Inc: www.americanstandard-us.com.
      b. Gerber Plumbing Fixtures LLC: www.gerberonline.com.
      c. Kohler Company: www.kohler.com.
      d. Zurn Industries, Inc: www.zurn.com.
      e. Substitutions: See Section 016000 - Product Requirements.

B. Flush Valves:
   1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
   2. Manufacturers:
      a. American Standard, Inc: www.americanstandard-us.com.
      b. Delany Products: www.delanyvalve.com.
      c. Sloan Valve Company: www.sloanvalve.com.
      d. Zurn Industries, Inc: www.zurn.com.
      e. Substitutions: See Section 016000 - Product Requirements.

C. Toilet Seats:
   1. Manufacturers:
      a. American Standard, Inc: www.americanstandard-us.com.
      b. Bemis Manufacturing Company: www.bemismfg.com.
      c. Church Seat Company; _____: www.churchseats.com/#sle.
      d. Zurn Industries, Inc: www.zurn.com.
      e. Substitutions: See Section 016000 - Product Requirements.
   2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, with cover.

2.03 TANK TYPE WATER CLOSETS

A. Manufacturers:
   1. American Standard, Inc; Baby Devoro, Flo-Wise, 2-Piece Gravity: www.americanstandard-us.com/#sle.
   2. DXV by American Standard, Inc; _____: www.dxv.com/#sle.
   3. Gerber Plumbing Fixtures LLC; _____: www.gerberonline.com/#sle.
   4. Kohler Company: www.kohler.com/#sle.
   5. PROFLO; Amador Series: www.ferguson.com/#sle.
   6. Sloan Valve: www.sloanvalve.com/#sle.
   7. Zurn Industries, LLC: www.zurn.com/#sle.
   8. Substitutions: See Section 016000 - Product Requirements.

B. Floor-Mounted Bowl:
   1. ASME A112.19.2; siphon jet, vitreous china, 16.5 inches (420 mm) high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
   2. Water Consumption: 1.6 gal (6 L) per flush, maximum.

C. Toilet Seats:
   1. Plastic: Solid, white, enlongated, closed front, slow-closing hinged seat cover, and brass bolts with covers.
   2. Manufacturers:

a. American Standard, Inc: www.americanstandard-us.com/#sle.
b. Bemis Manufacturing Company: www.bemismfg.com/#sle.
c. PROFLO; Camas - Slow Close, Easy Clean, Heavy Duty: www.ferguson.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

3.04 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 CLEANING

A. Clean plumbing fixtures and equipment.

3.06 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

3.07 SCHEDULES

A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
   1. Water Closet:
      a. Standard: 15 inches (380 mm) to top of bowl rim.
      b. Accessible: 18 inches (455 mm) to top of seat.
   2. Water Closet Flush Valves:
      a. Standard: 11 inches (280 mm) min. above bowl rim.
      b. Recessed: 10 inches (255 mm) min. above bowl rim.
   3. Urinal:
      a. Standard: 22 inches (560 mm) to top of bowl rim.
      b. Accessible: 17 inches (430 mm) to top of bowl rim.
   4. Lavatory:
      a. Standard: 31 inches (785 mm) to top of basin rim.
      b. Accessible: 34 inches (865 mm) to top of basin rim.

END OF SECTION

SECTION 230130.51 - HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleaning of HVAC duct system, equipment, and related components.

1.02 DEFINITIONS

A. HVAC System: For purposes of this section, the surfaces to be cleaned include all interior surfaces of the heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system, including the inside of air distribution equipment, coils, and condensate drain pans; see NADCA ACR for more details.

1.03 REFERENCE STANDARDS

A. NADCA ACR - The NADCA Standard for Assessment, Cleaning, and Restoration of HVAC System; 2021.

PART 2 PRODUCTS

2.01 TOOLS AND EQUIPMENT

A. Vacuum Devices and Other Tools: Exceptionally clean, in good working order, and sealed when brought into the facility.

B. Vacuum Devices That Exhaust Air Inside Building, Including Hand-Held and Wet Vacuums: Equipped with HEPA filtration with 99.97 percent collection efficiency for minimum 0.3-micron size particles and DOP test number.

C. Vacuum Devices That Exhaust Air Outside Building, Including Truck- and Trailer-Mounted Types: Equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system; exhausted in manner that prevents contaminant re-entry to building; compliant with applicable regulations as to outdoor environmental contamination.

END OF SECTION

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

D. Three phase electric motors.

E. Electronically Commutated Motors (ECM).

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

B. Section 262913 - Enclosed Controllers.

1.03 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; 2021.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

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

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

E. Operation Data: Include instructions for safe operating procedures.

F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

B. Motors located in exterior locations: Totally enclosed type.

2.03 ELECTRONICALLY COMMUTATED MOTORS (ECM)

A. Applications:
   1. Commercial:
      a. Roof Top Unit:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion joints and compensators.

C. Pipe loops, offsets, and swing joints.

1.02 REFERENCE STANDARDS

A. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

B. EJMA (STDS) - EJMA Standards; Tenth Edition.

C. FM (AG) - FM Approval Guide; current edition.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

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

B. Product Data:
   1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
   2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Design Data: Indicate selection calculations.

D. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.

E. Maintenance Data: Include adjustment instructions.

F. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.
   2. Extra Packing for Packed Expansion Joints: One set for each joint.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with UL (DIR) requirements.

2.02 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Inner Hose: Bronze.

B. Exterior Sleeve: Single braided, stainless steel.

C. Pressure Rating: 125 psi up to 12 inch (862 kPa up to 300 mm, DN).

D. Maximum Service Temperature: 450 degrees F (232 degrees C).

E. End Connections: Flanged.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4 inch (20 mm) on each side of installed center line.

2.03 EXPANSION JOINTS - HOSE AND BRAID

A. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support brackets and plugged drain port for steam service.

B. Maximum Allowable Motion: 2 inch (50.8 mm) in the x, y, and z planes with no thrust loads to the building structure

C. Maximum Working Pressure: 150 psi (1030 kPa) at 800 degrees F (426.7 degrees C).

D. Construction: Class 150, schedule 40, stainless steel hose and braid assembly with carbon steel fittings, including elbows and flanged end connections sized to match pipe segment
   1. Selected Product to Accommodate:
      a. Compression and Expansion Axial Deflection: _____ inch (_____ mm).
      b. Angular Rotation: 15 degrees.
      c. Force developed by 1.5 times specified maximum allowable operating pressure.
   2. Provide necessary accessories including, but not limited to, swivel joints.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

END OF SECTION

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic restraint systems.

1.02 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

B. MFMA-4 - Metal Framing Standards Publication; 2004.

1.03 SUBMITTALS

A. Shop Drawings:

1. Include the seal of the Professional Structural Engineer registered in the State of the project in which the Project is located, on the drawings and calculations which at a minimum include the following:

1.04 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kinetics Noise Control, Inc: www.kineticsnoise.com.

B. Mason Industries: www.mason-ind.com.

C. Vibration Eliminator Company, Inc: www.veco-nyc.com.

2.02 SEISMIC RESTRAINT SYSTEMS

1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

PART 3 EXECUTION

3.01 INSTALLATION

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.03 SUBMITTALS

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

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Piping: Tags.

C. Thermostats: Nameplates.

D. Valves: Tags.

2.02 NAMEPLATES

A. Manufacturers:
   1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
   2. Brimar Industries, Inc: www.pipemarker.com.
   3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Letter Color: White.

C. Letter Height: 1/4 inch (6 mm).

D. Background Color: Black.

E. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Manufacturers:
   1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
   2. Brady Corporation: www.bradycorp.com.
   3. Brimar Industries, Inc: www.pipemarker.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation: www.bradycorp.com.

2. Brimar Industries, Inc: www.pipemarker.com.
3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
1. Identify service, flow direction, and pressure.
2. Install in clear view and align with axis of piping.
3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Commissioning activities.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024.

B. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.03 SUBMITTALS

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

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to the Commissioning Authority.
   2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   3. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Logs: Submit at least twice a week to the Commissioning Authority.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having minimum of three years documented experience.
3. Certified by one of the following:
   a. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

3.05 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. Air Cooled Condensers:
1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.
8. Number of compressors.

C. Heating Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

D. Terminal Unit Data:
1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. Minimum static pressure.

8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.
11. Inlet static pressure.

END OF SECTION

SECTION 230713 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corporation: www.ocbuildingspec.com.
   4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1,200 degrees F (649 degrees C).
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
   4. CertainTeed Corporation: www.certainteed.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F (232 degrees C).
   3. Maximum Water Vapor Absorption: 5.0 percent.
   4. Maximum Density: 8.0 pcf (128 kg/cu m).

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 DUCT LINER

A. Manufacturers:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corporation: www.ocbuildingspec.com/sle.
   4. CertainTeed Corporation: www.certainteed.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
   1. Fungal Resistance: No growth when tested according to ASTM G21.

2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F (0.045 at 24 degrees C).
3. Service Temperature: Up to 250 degrees F (121 degrees C).
4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Ducts Conveying Air Below Ambient Temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated Ducts Conveying Air Above Ambient Temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

3.03 SCHEDULES

A. Exhaust Ducts Within 10 ft (3 m) of Exterior Openings: As per Energy Code

B. Outside Air Intake Ducts: As per Energy Code

C. Supply Ducts: Glass Fiber, Flexible: As per Energy Code

END OF SECTION

SECTION 230719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
   1. Aeroflex USA, Inc: www.aeroflexusa.com.
   2. Armacell LLC: www.armacell.us.
   3. K-Flex USA LLC: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 180 degrees F (82 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

3.03 SCHEDULE

A. Cooling Systems:
   1. Condensate Drains from Cooling Coils:

END OF SECTION

SECTION 230923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. System description.

B. Operator interface.

C. Controllers.

D. Power supplies and line filtering.

E. System software.

F. Controller software.

G. HVAC control programs.

1.02 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC.

B. Section 230993 - Sequence of Operations for HVAC Controls.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2012.

B. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2022h, with Editorial Revision.

C. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

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

B. Product Data: Provide data for each system component and software module.

C. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. List connected data points, including connected control unit and input device.
   3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
   4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   5. Indicate description and sequence of operation of operating, user, and application software.

D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

C. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Substantial Completion.

C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Distech Controls .

2.02 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 230913.

E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 OPERATOR INTERFACE

A. PC Based Work Station:
   1. Resides on high speed network with building controllers.
   2. Connected to server for full access to all system information.

B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.

C. BACnet protocol to comply with ASHRAE Std 135.

D. Hardware:
   1. Desktop:
      a. Computer(s) and display(s) to be provided by DDC controls manufacturer.
      b. Location(s): As directed by the Owner.
      c. Network Connection:
         1) Ethernet interface card.
      d. System Printer:
         1) Printer(s) to be provided by DDC controls manufacturer.
         2) Locations(s): As directed by the Owner.

2.04 CONTROLLERS

         1) Mount within waterproof enclosures.
         2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).

B. Custom Application Controller:
   1. General:
      a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
      b. Share data between networked, microprocessor based controllers.

c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
d. Utilize real-time clock for scheduling.
e. Continuously check processor status and memory circuits for abnormal operation.
f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
g. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
4. Provisions for Serviceability:
   a. Diagnostic LED's for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet (1 m).

C. Application Specific Controllers:
1. General:
   a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
   b. Customized for operation within the confines of equipment served.
   c. Communication with other network devices to be based on assigned protocol.
2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet (1 m).

2.05 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:
   1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
   2. Limit connected loads to 80 percent of rated capacity.
   3. Match DC power supply to current output and voltage requirements.
   4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
   5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
   6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
   7. Operational Ambient Conditions: 32 to 120 degrees F (0 to 50 degrees C).
   8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
   9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:
   1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
   2. Minimum surge protection attributes:
      a. Dielectric strength of 1000 volts minimum.
      b. Response time of 10 nanoseconds or less.
      c. Transverse mode noise attenuation of 65 dB or greater.
      d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.06 LOCAL AREA NETWORK (LAN)

A. Provide communication between control units over local area network (LAN).

B. LAN Capacity: Not less than 60 stations or nodes.

C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

D. LAN Data Speed: Minimum 19.2 Kb.

E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

F. Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.

G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.07 SYSTEM SOFTWARE

A. Operating System:
   1. Concurrent, multi-tasking capability.
      a. Common Software Applications Supported: Microsoft Excel.
      b. Acceptable Operating Systems: As per Owner.

2. System Graphics:
    a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
    b. Animation displayed by shifting image files based on object status.
    c. Provide method for operator with password to perform the following:
        1) Move between, change size, and change location of graphic displays.
        2) Modify on-line.
        3) Add, delete, or change dynamic objects consisting of:
            (a) Analog and binary values.
            (b) Dynamic text.
            (c) Static text.
            (d) Animation files.
3. Custom Graphics Generation Package:
    a. Create, modify, and save graphic files and visio format graphics in PCX formats.
    b. HTML graphics to support web browser compatible formats.
    c. Capture or convert graphics from AutoCAD.

B. Workstation System Applications:
1. Automatic System Database Save and Restore Functions:
    a. Current database copy of each Building Controller is automatically stored on hard disk.
    b. Automatic update occurs upon change in any system panel.
    c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
    a. Save database from any system panel.
    b. Clear a panel database.
    c. Initiate a download of a specified database to any system panel.
3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
4. On-line Help:
    a. Context-sensitive system assists operator in operation and editing.
    b. Available for all applications.
    c. Relevant screen data provided for particular screen display.
    d. Additional help available via hypertext.
5. Security:
    a. Operator log-on requires user name and password to view, edit, add, or delete data.
    b. System security selectable for each operator.
    c. System supervisor sets passwords and security levels for all other operators.
    d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
    e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
    f. All system security data stored in encrypted format.
6. System Diagnostics:
    a. Operations Automatically Monitored:
        1) Workstations.
        2) Printers.
        3) Modems.
        4) Network connections.
        5) Building management panels.
        6) Controllers.

b. Device failure is annunciated to the operator.

7. Alarm Processing:
   a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
   b. Configurable Objects:
      1) Alarm limits.
      2) Alarm limit differentials.
      3) States.
      4) Reactions for each object.
8. Alarm Messages:
   a. Descriptor: English language.
   b. Recognizable Features:
      1) Source.
      2) Location.
      3) Nature.
9. Configurable Alarm Reactions by Workstation and Time of Day:
   a. Logging.
   b. Printing.
   c. Starting programs.
   d. Displaying messages.
   e. Dialing out to remote locations.
   f. Paging.
   g. Providing audible annunciation.
   h. Displaying specific system graphics.
10. Custom Trend Logs:
    a. Definable for any data object in the system including interval, start time, and stop time.
    b. Trend Data:
       1) Sampled and stored on the building controller panel.
       2) Archivable on hard disk.
       3) Retrievable for use in reports, spreadsheets and standard database programs.
       4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
       5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
11. Alarm and Event Log:
    a. View all system alarms and change of states from any system location.
    b. Events listed chronologically.
    c. Operator with proper security acknowledges and clears alarms.
    d. Alarms not cleared by operator are archived to the workstation hard disk.
12. Object, Property Status and Control:
    a. Provide a method to view, edit if applicable, the status of any object and property in the system.
    b. Status Available by the Following Methods:
       1) Menu.
       2) Graphics.
       3) Custom Programs.
13. Reports and Logs:
    a. Reporting Package:
       1) Allows operator to select, modify, or create reports.
       2) Definable as to data content, format, interval, and date.
       3) Archivable to hard disk.
    b. Real-time logs available by type or status such as alarm, lockout, normal, etc.

c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
d. Set to be printed on operator command or specific time(s).

14. Reports:
    a. Standard:
        1) Objects with current values.
        2) Current alarms not locked out.
        3) Disabled and overridden objects, points and SNVTs.
        4) Objects in manual or automatic alarm lockout.
        5) Objects in alarm lockout currently in alarm.
        6) Logs:
            (a) Alarm History.
            (b) System messages.
            (c) System events.
            (d) Trends.
    b. Custom:
        1) Daily.
        2) Weekly.
        3) Monthly.
        4) Annual.
        5) Time and date stamped.
        6) Title.
        7) Facility name.
    c. Tenant Override:
        1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
        2) Annual report showing override usage on a monthly basis.
    d. Electrical, Fuel, and Weather:
        1) Electrical Meter(s):
            (a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
            (b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.
        2) Fuel Meter(s):
            (a) Monthly showing daily natural gas consumption for each meter.
            (b) Annual summary showing monthly consumption for each meter.
        3) Weather:
            (a) Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.

C. Workstation Applications Editors:
    1. Provide editing software for each system application at PC workstation.
    2. Downloaded application is executed at controller panel.
    3. Full screen editor for each application allows operator to view and change:
        a. Configuration.
        b. Name.
        c. Control parameters.
        d. Set-points.
    4. Scheduling:
        a. Monthly calendar indicates schedules, holidays, and exceptions.
        b. Allows several related objects to be scheduled and copied to other objects or dates.
        c. Start and stop times adjustable from master schedule.
    5. Custom Application Programming:

a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
b. Programming Features:
   1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
   2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
   3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
   4) Allows the development of independently, executing, program modules designed to enable and disable other modules.
   5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
   6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
   7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
   8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values cab be used in IF/THEN comparisons, calculations, programming statement logic, etc.
   9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

2.08 CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
   1. User access secured via user passwords and user names.
   2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
   3. User Log On/Log Off attempts are recorded.
   4. Automatic Log Off occurs following the last keystroke after a user defined delay time.

C. Object or Object Group Scheduling:
   1. Weekly Schedules Based on Separate, Daily Schedules:
      a. Include start, stop, optimal stop, and night economizer.
      b. 10 events maximum per schedule.
      c. Start/stop times adjustable for each group object.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
   1. Binary object is set to alarm based on the operator specified state.
   2. Analog object to have high/low alarm limits.
   3. All alarming is capable of being automatically and manually disabled.
   4. Alarm Reporting:
      a. Operator determines action to be taken for alarm event.
      b. Alarms to be routed to appropriate workstation.
      c. Reporting Options:

F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

G. Sequencing: Application software based upon specified sequences of operation in Section 230993.

H. PID Control Characteristics:
   1. Direct or reverse action.
   2. Anti-windup.
   3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
   4. User selectable controlled variable, set-point, and PED gains.

I. Staggered Start Application:
   1. Prevents all controlled equipment from simultaneously restarting after power outage.
   2. Order of equipment startup is user selectable.

J. Energy Calculations:
   1. Accumulated instantaneous power or flow rates are converted to energy use data.
   2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
   3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

K. Anti-Short Cycling:
   1. All binary output objects protected from short-cycling.
   2. Allows minimum on-time and off-time to be selected.

L. On-Off Control with Differential:
   1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
   2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

M. Run-Time Totalization:
   1. Totalize run-times for all binary input objects.
   2. Provides operator with capability to assign high run-time alarm.

2.09 HVAC CONTROL PROGRAMS

A. General:
   1. Support Inch-pounds and SI (metric) units of measurement.
   2. Identify each HVAC Control system.

B. Optimal Run Time:
   1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
   2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
   3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
   4. Use outside air temperature to determine early shut down with ventilation override.
   5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.

C. Supply Air Reset:
   1. Monitor heating and cooling loads in building spaces, terminal reheat systems, both hot deck and cold deck temperatures on dual duct and multizone systems, single zone unit discharge temperatures.
   2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
      a. Raising cooling temperatures to highest possible value.
      b. Reducing heating temperatures to lowest possible level.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.02 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993.

C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.03 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.

3.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to Owner.

END OF SECTION

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

1.02 SUBMITTALS

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

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
   1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
   2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
   3. Include at least the following sequences:
      a. Start-up.
      b. Warm-up mode.
      c. Normal operating mode.
      d. Unoccupied mode.
      e. Shutdown.
   4. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

END OF SECTION

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

1.02 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels.

B. Section 099113 - Exterior Painting.

C. Section 099123 - Interior Painting.

D. Section 230516 - Expansion Fittings and Loops for HVAC Piping.

E. Section 335216 - Gas Hydrocarbon Piping.

1.03 REFERENCE STANDARDS

A. ANSI Z223.1 - National Fuel Gas Code; 2015.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

F. ASME B31.1 - Power Piping; 2014.

G. ASME B31.9 - Building Services Piping; 2020.

H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

K. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

L. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

M. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

1.04 SUBMITTALS

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

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.

D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, and ASTM specification.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: ANSI Z223.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

B. Copper Tubing: Listed, ASTM B88 (ASTM B88M), Type K (A), annealed.
   1. Fittings: ASME B16.18 cast copper or ASME B16.22 wrought copper.
   2. Joints: Compression connection or AWS A5.8M/A5.8, BCuP silver braze.
   3. Mechanical Press Sealed Fittings: Double-pressed type and approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

C. Flexible Gas Piping:
   1. Corrugated Stainless Steel Tubing: Comply with ANSI LC1 / CSA 6.26.
   2. Fittings: Provided by piping system manufacturer.

2.02 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.

2.03 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch (25 mm):
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

2.05 BALL VALVES

A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 230516.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.
   1. Coordinate size and location of access doors with Section 083100.

I. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
   1. Painting of interior piping systems and components is specified in Section 099123.
   2. Painting of exterior piping systems and components is specified in Section 099113.

J. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install ball valves for throttling, bypass, or manual flow control services.

E. Provide plug valves in natural gas systems for shut-off service.

3.05 SERVICE CONNECTIONS

A. Provide new gas service complete with gas meter and regulators in accordance with Section 335216. Gas service distribution piping to have initial minimum pressure of 7 inch wg (1.75 kPa). Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.06 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:
   a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
      1) Maximum Hanger Spacing: 6.5 ft (2 m).
      2) Hanger Rod Diameter: 3/8 inches (9 mm).
   b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
      1) Maximum Hanger Spacing: 10 ft (3 m).
      2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

1.02 RELATED REQUIREMENTS

A. Section 233319 - Duct Silencers.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

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

B. Product Data: Provide data for duct materials.

C. Shop Drawings: All Systems
   1. Fabrication, assembly and installation, including plans, elevations, sections, components and attachments to other work.
   2. Factory and shop fabricated ducts and fittings.
   3. Duct layout indicating sizes, configuration, liner material, and static pressure classes.
   4. Elevation of top of ducts.
   5. Dimensions of main duct runs from building grid lines.
   6. Fittings.
   7. Reinforcing and spacing.
   8. Seam and joint construction.
   9. Penetrations through fire-rated and other partitions.
   10. Equipment installation based on equipment being used on Project.
   11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   12. Hangers and supports, including methods for duct and building attachment, seismic restraints and vibration isolation.

1.05 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items below:
   1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
   2. Suspended ceiling components.
   3. Structural members to which duct will be attached.
   4. Size and location of initial access modules for acoustical tile.
   5. Penetrations of smoke barriers and fire rated construction.
   6. Items penetrating finished ceiling including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Permiter moldings
      f. Access Panels.

1.06 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:

E. Duct Sealing and Leakage in accordance with Static Pressure Class:

F. Duct Fabrication Requirements:

1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

A. Material Requirements:

1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

D. Flexible Ducts: Connect to metal ducts with adhesive.

E. Duct sizes indicated are inside precise dimensions. For lined ducts, maintain sizes inside lining.

F. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

H. Connect terminal units to supply ducts directly or with 1-foot (300 mm) maximum length of flexible duct. Do not use a flexible duct to change direction.

3.02 CLEANING

A. Clean thoroughly each duct system as indicated within Section 230130.51.

B. Clean the duct system and force air at high velocity through the duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backdraft dampers - metal.

B. Duct access doors.

C. Duct test holes.

D. Flexible duct connectors.

E. Volume control dampers.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 233100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

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

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS - METAL

A. Manufacturers:
   1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com.
   2. Nailor Industries, Inc: www.nailor.com.
   3. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch (150 mm) width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.02 DUCT ACCESS DOORS

A. Manufacturers:
   1. Acudor Products Inc, a Division of Nelson Industrial Inc: www.acudor.com.
   2. Elgen Manufacturing, Inc: www.elgenmfg.com.
   3. Nailor Industries, Inc: www.nailor.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.03 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.
   1. Manufacturers:
      a. Carlisle HVAC Products; Dynair Test Port with Red Cap with O-Ring Seal: www.carlislehvac.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

2.04 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:
   1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/#sle.
   2. Elgen Manufacturing: www.elgenmfg.com.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd (1.0 kg/sq m).

2.05 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com.
   2. Nailor Industries Inc: www.nailor.com.
   3. Ruskin Company: www.ruskin.com.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Splitter Dampers:
   1. Material: Same gauge as duct to 24 inches (600 mm) size in either direction, and two gauges heavier for sizes over 24 inches (600 mm).
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch (6 mm) diameter rod in self aligning, universal joint action, flanged bushing with set screw.

D. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
   2. Blade: 24 gauge, 0.0239 inch (0.61 mm), minimum.

E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   1. Blade: 18 gauge, 0.0478 inch (1.21 mm), minimum.

F. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

G. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Demonstrate re-setting of fire dampers to Owner's representative.

G. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

H. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

J. Use splitter dampers only where indicated.

K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 233319 - DUCT SILENCERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct silencers.

B. Ductwork lagging.

1.02 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings: Connections to silencers.

B. Section 233300 - Air Duct Accessories: Flexible duct connections.

1.03 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.

C. AHRI 575 - Method of Measuring Machinery Sound Within an Equipment Space; 2017.

D. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

F. AMCA 302 - Application of Sone Loudness Ratings for Non-Ducted Air Moving Devices; 1973 (Reaffirmed 2012).

G. AMCA 303 - Application of Sound Power Level Ratings for Fans; 1979 (Reaffirmed 2012).

H. ANSI/ASA S1.4 PART 3 - American National Standard Electroacoustics – Sound Level Meters – Part 3: Periodic Tests; 2014 (Reaffirmed 2024).

I. ANSI S1.8 - American National Standard Reference Values for Levels Used in Acoustics and Vibrations; 2016 (Reaffirmed 2020).

J. ANSI S1.13 - American National Standard Measurement of Sound Pressure Levels in Air; 2020.

K. ANSI S12.1 - American National Standard Guidelines for the Preparation of Standard Procedures to Determine the Noise Emission from Sources; 1983 (Reaffirmed 2023).

L. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. ASHRAE Std 68 - Laboratory Method of Testing to Determine the Sound Power in a Duct; 1997.

N. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

Q. ASTM E477 - Standard Test Method for Laboratory Measurements of Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers; 2020.

R. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures; 2022.

S. NEBB (STDS) - Procedural Standard for Measurement of Sound and Vibration; 2015, with Errata (2022).

T. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

U. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

V. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance.

C. Shop Drawings: Indicate assembly, materials, thicknesses, dimensional data, pressure losses, acoustical performance, layout, and connection details.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable codes for sound levels between wall partitions.

2.02 DUCT SILENCERS

A. Description: Duct section with sheet metal outer casing, sound absorbing fill material, and inner casing of perforated sheet metal; incorporating interior baffles of similar construction. Fabricate in accordance with SMACNA (DCS) HVAC Duct Construction Standards.

B. General Requirements:
1. Casing, sealants, adhesives, accessory materials, and packing materials to comply with ASTM E84.
2. Airstream surfaces installed in a return air plenum to comply with requirements in ASHRAE Std 62.1.
3. Factory-fabricated, field-installed products.

2.03 DUCTWORK LAGGING

A. Thickness: 2 inches (50 mm), maximum.

B. Acoustic Insulation: Composed of glass fiber.

C. Covering: Foil facing.

D. Sound Transmission Class: Not less than 20 when tested in accordance with ASTM E90.

END OF SECTION

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof ventilators.

1.02 RELATED REQUIREMENTS

A. Section 230513 - Common Motor Requirements for HVAC Equipment.

B. Section 230548 - Vibration and Seismic Controls for HVAC.

C. Section 233300 - Air Duct Accessories: Backdraft dampers.

1.03 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; http://www.amca.org/certified/search/company.aspx.

B. AMCA 99 - Standards Handbook; 2016.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).

E. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

G. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

C. PennBarry: www.pennbarry.com.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 ROOF VENTILATORS

A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch (13 mm) mesh, 0.62 inch (1.6 mm) thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

B. Roof Curb: 8 inch (200 mm) high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.

C. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Hung Cabinet Fans:
   1. Install flexible connections specified in Section 233300 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch (25 mm) flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

END OF SECTION

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers:
   1. Perforated ceiling diffusers.

B. Slot ceiling diffusers.

C. Registers/grilles:
   1. Ceiling-mounted, egg crate exhaust and return register/grilles.
   2. Ceiling-mounted, exhaust and return register/grilles.
   3. Ceiling-mounted, supply register/grilles.
   4. Wall-mounted, supply register/grilles.
   5. Wall-mounted, exhaust and return register/grilles.

D. Roof hoods.

E. Gravity ventilators.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Painting of ducts visible behind outlets and inlets.

1.03 REFERENCE STANDARDS

A. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).

B. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2022.

C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

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

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.05 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes, a division of Carnes Company Inc: www.carnes.com.

B. Hart & Cooley, Inc: www.hartandcooley.com.

C. Price Industries: www.price-hvac.com.

D. Titus: www.titus-hvac.com.

E. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORATED FACE CEILING DIFFUSERS

A. Type: Perforated face with fully adjustable pattern and removable face.

B. Frame: Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Stainless steel.

D. Color: As selected by Architect from manufacturer's standard range.

2.03 CEILING SLOT DIFFUSERS

A. Type: Continuous 1/2 inch (13 mm) wide slot, 1 slots wide, with adjustable vanes for left, right, or vertical discharge; integral ceiling fire damper.

B. Fabrication: Aluminum extrusions with factory clear lacquer finish.

C. Color: To be selected by Architect from manufacturer's standard range.

D. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket, mitered end border.

E. Plenum: Integral, galvanized steel, insulated.

2.04 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, one-way deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Construction: Made of aluminum extrusions with factory enamel finish.

D. Color: As selected by Architect from manufacturer's standard range.

2.05 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

2.06 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch (13 by 13 by 13 mm), 1/2 by 1/2 by 1 inch (13 by 13 by 25 mm), and 1 by 1 by 1 inch (25 by 25 by 25 mm) grid core.

B. Fabrication: Grid core consists of aluminum with mill aluminum finish.

C. Color: To be selected by Architect from manufacturer's standard range.

D. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

E. Frame: Channel lay-in frame for suspended grid ceilings.

F. Accessories: Provide integral gang and face operated opposed blade damper, 2 inch filter frame (50 mm), plaster frame, square mesh insect screen, square mesh debris screen, prescored molded fiberglass back, and 45 degree angled eggcrate or other similar provisions for visual blocking such as angled louver or 90 degree duct elbow.

2.07 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

2.08 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

2.09 ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA (DCS).

B. Fabricate of galvanized steel, minimum 16 gauge, 0.0598 inch (1.52 mm) base and 20 gauge, 0.0359 inch (0.91 mm) hood, or aluminum, minimum 16 gauge, 0.0598 inch (1.52 mm) base and 18 gauge, 0.0598 inch (1.21 mm) hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch (13 mm) square mesh for exhaust and 3/4 inch (19 mm) for intake, and factory prime coat finish.

C. Mount unit on minimum 12 inch (300 mm) high curb base with insulation between duct and curb.

2.10 GRAVITY VENTILATORS

A. Hood Intake and Relief Gravity Ventilator:
   1. Manufacturers:
      a. American Coolair Corporation: www.coolair.com.
      b. Greenheck Fan Corporation: www.greenheck.com.
      c. Loren Cook Company: www.lorencook.com.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. General:
      a. Low silhouette for intake applications with natural gravity or negative pressure system(s).
      b. Performance ratings and factory testing to be in accordance with AMCA 511 and AMCA 550.
   3. Hood and Base:
      a. Material: Aluminum.
      b. Hood Construction: Precision formed, arched panels with interlocking seams.
      c. Vertical End Panels: Fully locked into hood end panels.
   4. Birdscreen:
      a. Fabricate in accordance with ASTM B221 (ASTM B221M).
      b. Construction: 1/2 inch (12.7 mm) Galvanized mesh.
      c. Horizontally mounted across hood intake area.
   5. Hood Support: Galvanized steel construction and fastened so hood can be removed completely from the base or hinged open.
   6. Options/Accessories:
      a. Roof Curbs:
         1) Flat Roofs:
            (a) Welded, straight side curb with flashing flange and wood nailer.
         2) Pitched Roofs: Welded, straight side curb with flashing flange and wood nailer.
         3) Mounted on the roof with fan.
         4) Material: Aluminum.
         5) Insulation Thickness: 1 inch (25.4 mm).
      b. Dampers:
         1) Type: Motorized.
      c. Insect Screen:
         1) Fabricate in accordance with ASTM B221 (ASTM B221M).

2) Construct of fine mesh aluminum.
3) Fitted to top of the throat to prevent entry of insects.

B. Spun Aluminum Intake and Relief Gravity Ventilator:
1. Manufacturers:
a. American Coolair Corporation: www.coolair.com.
b. Greenheck Fan Corporation: www.greenheck.com.
c. Loren Cook Company: www.lorencook.com.
d. Substitutions: See Section 016000 - Product Requirements.
2. General:
a. Provide low silhouette configuration for intake applications with natural gravity or negative pressure system.
b. Performance ratings and factory testing to be in accordance with AMCA 511 and AMCA 550.
3. Hood:
a. Material: Aluminum.
b. Internal structure constructed of galvanized steel.
4. Birdscreen:
a. Fabricate in accordance with ASTM B221 (ASTM B221M).
b. Construction: 1/2 inch (12.7 mm) galvanized mesh.
c. Horizontally mounted across hood intake area.
5. Housing:
a. Curb Cap:
1) Type: No Hinged.
2) Construction: Aluminum.
3) Integral deep spun inlet venturi with pre-punched mounting holes to ensure correct attachment to roof.
6. Options/Accessories:
a. Roof Curbs:
1) Flat Roofs:
(a) Welded, straight side curb with flashing flange and wood nailer.
2) Pitched Roofs: Welded, straight side curb with flashing flange and wood nailer.
3) Mounted upon the roof with fan.
4) Material: Aluminum.
5) Insulation Thickness: 1 inch (25.4 mm).
b. Dampers:
1) Type: Motorized.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

F. Paint ductwork visible behind air outlets and inlets matte black, see Section 099123.

END OF SECTION

SECTION 237413 - PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged roof top unit.

B. Roof mounting curb and base.

1.02 SUBMITTALS

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

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.03 WARRANTY

A. See Section 01 7700 - Closeout Procedures for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp: www.carrier.com.

B. Trane, a brand of Ingersoll Rand: www.trane.com.

C. AAON

D. Daikin.

E. Substitutions: See Section 016000 - Product Requirements.

2.02 MANUFACTURED UNITS

A. General: Roof mounted units having gas burner and electric refrigeration.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

D. Disconnect Switch: Factory mount disconnect switch on equipment.

2.03 FABRICATION

A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).

B. Heat Exchangers: Aluminized steel, of welded construction.

C. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted high efficiency motor or direct drive as indicated. Isolate complete fan assembly. Refer to Section 220548.

D. Air Filters:
   1. 1 inch (25 mm) thick permanent washable.

E. Roof Mounting Curb: 14 inches (350 mm) high galvanized steel, channel frame with gaskets, nailer strips.

2.04 BURNER

A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

2.05 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 Tons of refrigeration (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 Tons of refrigeration (26 kW) cooling capacity and larger.

2.06 COMPRESSOR

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

2.07 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.08 OPERATING CONTROLS - SINGLE ZONE UNITS

A. Electric solid state microcomputer based room thermostat, located as indicated.

B. Room thermostat shall incorporate:
   1. Automatic switching from heating to cooling.
   2. Preferential rate control to minimize overshoot and deviation from set point.
   3. Set-up for four separate temperatures per day.
   4. Instant override of set point for continuous or timed period from one hour to 31 days.
   5. Short cycle protection.
   6. Programming based on weekdays, Saturday and Sunday.
   7. Switch selection features including imperial or metric display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.

C. Room thermostat display shall include:
   1. Actual room temperature.
   2. Programmed temperature.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.03 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

3.04 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

B. Demonstrate operation to Owner's maintenance personnel.

END OF SECTION

SECTION 260505 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems and low voltage systems on the existing exterior wall that is being covered by new construction.

B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

C. Existing Electrical Service to remain as-is. : Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

D. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
   1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
   2. PCB- and DEHP-containing lighting ballasts.
   3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove electrical disconnect switches serving equipment being removed.

G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

H. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Armored cable.

C. Metal-clad cable.

D. Wiring connectors.

E. Electrical tape.

F. Heat shrink tubing.

G. Oxide inhibiting compound.

H. Wire pulling lubricant.

I. Cable ties.

J. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 4 - Armored Cable; Current Edition, Including All Revisions.

L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Armored cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet (1.8 m).
      b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
   2. In addition to other applicable restrictions, may not be used:
      a. Where exposed to view.
      b. Where exposed to damage.
      c. For damp, wet, or corrosive locations.

D. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:

a. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
   1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

2. In addition to other applicable restrictions, may not be used:
   a. Where exposed to view.
   b. Where exposed to damage.
   c. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

H. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.

I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

J. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
   3. Color Code:
      a. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.
      c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
   1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
a. Size 4 AWG and Larger: Type XHHW-2.

2.04 ARMORED CABLE

A. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN.

E. Grounding: Combination of interlocking armor and integral bare bonding wire.

F. Armor: Steel, interlocked tape.

2.05 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

G. Provide PVC jacket applied over cable armor.

2.06 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

2.07 ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.

4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
3. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
   a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
   b. Branch circuits fed from feed-through protection of GFI receptacles.
   c. Branch circuits with dimming controls.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install armored cable (Type AC) in accordance with NECA 120.

E. Install metal-clad cable (Type MC) in accordance with NECA 120.

F. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

I. Terminate cables using suitable fittings.
1. Armored Cable (Type AC):
a. Use listed fittings and anti-short, insulating bushings.
b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
2. Metal-Clad Cable (Type MC):
a. Use listed fittings.
b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Identify conductors and cables in accordance with Section 260553.

Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Raceways may be used as sole equipment grounding conductor where permitted by NFPA 70. Provide insulated equipment grounding conductor where indicated or required, including but not limited to:
    a. In each nonmetallic feeder and branch circuit raceway.
    b. In each flexible conduit.

c. In outdoor portions of each metallic feeder and branch circuit raceway utilizing non-threaded fittings (where permitted) supplying rooftop multimotor and combination-load air-conditioning and refrigerating equipment.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

F. Communications Systems Grounding and Bonding:
1. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 270529 - Hangers and Supports for Communications Systems.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.

b. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
   a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Components for Vibration Isolation and/or Seismic Controls: See Section 260548.

C. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel Material:
   a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2-inch (13 mm) diameter.
   b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch (6 mm) diameter.
   c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch (10 mm) diameter.
   d. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.
   e. Outlet Boxes: 1/4-inch (6 mm) diameter.
   f. Luminaires: 1/4-inch (6 mm) diameter.

G. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.

H. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide required vibration isolation and/or seismic controls; see Section 260548.

H. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Secure fasteners in accordance with manufacturer's recommended torque settings.

J. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible metal conduit (FMC).

B. Liquidtight flexible metal conduit (LFMC).

C. Galvanized steel electrical metallic tubing (EMT).

D. Aluminum electrical metallic tubing (EMT).

E. Rigid polyvinyl chloride (PVC) conduit.

F. Electrical nonmetallic tubing (ENT).

G. Liquidtight flexible nonmetallic conduit (LFNC).

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.

C. Section 260526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

D. Section 260529 - Hangers and Supports for Electrical Systems.

E. Section 260533.16 - Boxes for Electrical Systems.

F. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

G. Section 262723 - Indoor Service Poles.

1.03 REFERENCE STANDARDS

A. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

F. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

G. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

J. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

K. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

L. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

M. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

N. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

O. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.

P. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

Q. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where conduit type for particular application is not specified, EMT.

C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.

D. Embedded Within Concrete:
   1. Within Slab on Grade: Use rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Fittings for Grounding and Bonding: See Section 260526 for additional requirements.

C. Provide conduit, fittings, supports, and accessories required for complete raceway system.

D. Provide products listed, classified, and labeled as suitable for purpose intended.

E. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4-inch (21 mm) trade size.
   2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
   3. Flexible Connections to Luminaires: 3/8-inch (12 mm) trade size.
   4. Underground, Interior: 3/4-inch (21 mm) trade size.

F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.05 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.06 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
   2. Material: Use aluminum.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.08 ELECTRICAL NONMETALLIC TUBING (ENT)

A. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA TC 13 and listed and labeled as complying with UL 1653.

B. Fittings:
   1. Manufacturer: Same as manufacturer of ENT to be connected.
   2. Use solvent-welded type fittings.

3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

2.09 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for type of conduit to be connected.

2.10 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).

E. Foam Conduit Sealant:
   1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Rated to hold minimum of 10 ft (3.0 m) water head pressure.

F. Conduit Mechanical Seals:
   1. Listed as complying with UL 514B.
   2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   3. Suitable for sealing around conductors/cables to be installed.

G. Sealing Systems for Concrete Penetrations:
   1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
   2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

H. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

I. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

D. Electrical Nonmetallic Tubing (ENT): Install in accordance with NECA 111.

E. Liquidtight Flexible Nonmetallic Conduit (LFNC): Install in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. Conceal conduits unless specifically indicated to be exposed.
   3. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
   4. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
   8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
   9. Use of wire for support of conduits is not permitted.
      a. For securing conduits to studs in hollow stud walls.
      b. For suspending conduits supported by spring steel conduit clips, where specifically indicated or permitted.
   10. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

H. Connections and Terminations:
   1. Use suitable adapters where required to transition from one type of conduit to another.
   2. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
   3. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
   4. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   4. Conceal bends for conduit risers emerging above ground.
   5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

J. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
a. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.

K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Maximum Conduit Size: 1-inch (27 mm) trade size unless otherwise approved.
2. Secure conduits to prevent floating or movement during pouring of concrete.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings or approved flexible connections to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Note location of expansion joint between existing exterior wall and new construction.

M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
a. Where conduits enter building from outside.
b. Where service conduits enter building from underground distribution system.
c. Where conduits enter building from underground.
d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
a. Where conduits pass from outdoors into conditioned interior spaces.
b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

O. Provide grounding and bonding; see Section 260526.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Correct deficiencies and replace damaged or defective conduits.

END OF SECTION

SECTION 260533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Floor boxes.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

D. Section 262726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Additional requirements for locating boxes for wiring devices.

E. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: Comply with Section 271000.
13. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.

E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Manufacturer: Same as manufacturer of floor box service fittings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
    a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
    b. Communications Systems Outlets: Comply with Section 271000.
4. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
5. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.

6. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
7. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
8. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
   a. Concealed above accessible suspended ceilings.
   b. Within joists in areas with no ceiling.
   c. Electrical rooms.
   d. Mechanical equipment rooms.

G. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

H. Install boxes plumb and level.

I. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

J. Install boxes as required to preserve insulation integrity.

K. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

L. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

O. Close unused box openings.

P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Q. Provide grounding and bonding in accordance with Section 260526.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

END OF SECTION

SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic control requirements.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 DEFINITIONS

A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

D. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.

B. Seismic Design Criteria: ICC (IBC).

C. Seismic Restraints:
   1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
      a. ASHRAE (HVACA).
      b. FEMA 413.
      c. FEMA E-74.
      d. SMACNA (SRM).
   3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.

D. Seismic Attachments:
   1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
   2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
   3. Do not use power-actuated fasteners.
   4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
   5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   6. Concrete Housekeeping Pads:
      a. Increase size of pad as required to comply with anchor requirements.
      b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

E. Seismic Interactions:
   1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
   2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

F. Seismic Relative Displacement Provisions:
   1. Use suitable fittings or flexible connections to accommodate:

a. Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Seismic Controls:
1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Seismic Controls:
1. Verify snubbing element air gaps.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Floor marking tape.

E. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 260536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

C. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

D. Section 271000 - Structured Cabling: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Panelboards:
         1) Identify power source and circuit number. Include location when not within sight of equipment.
         2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         3) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      b. Enclosed switches, circuit breakers, and motor controllers:

1) Identify power source and circuit number. Include location when not within sight of equipment.
2) Identify load(s) served. Include location when not within sight of equipment.

2. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
   a. Service equipment.
   b. Industrial control panels.
   c. Motor control centers.
   d. Elevator control panels.
   e. Industrial machinery.
3. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

C. Identification for Boxes:
1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

D. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 271000.
2. Wiring Device and Wallplate Finishes: Comply with Section 262726.
3. Use identification label to identify fire alarm system devices.
4. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
   a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
   a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:
   a. System Designation: 1 inch (25 mm).
   b. Equipment Designation: 1/2 inch (13 mm).
   c. Other Information: 1/4 inch (6 mm).
   d. Exception: Provide minimum text height of 1 inch (25 mm) for equipment located more than 10 feet (3.0 m) above floor or working platform.
5. Color:
   a. Normal Power System: White text on black background.
      1) 208Y/120 V, 3 Phase Equipment: White text on _____ background.
   b. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch (6 mm).
5. Color: Black text on white background unless otherwise indicated.

E. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

F. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch (3 mm).

F. Color: Black text on white background unless otherwise indicated.

2.04 FLOOR MARKING TAPE

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches (76 mm) wide, with alternating black and white stripes.

2.05 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
1. Materials:
2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Boxes: Outside face of cover.
   8. Conductors and Cables: Legible from the point of access.
   9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260583 - WIRING CONNECTIONS

PART 2 PRODUCTS

1.01 EQUIPMENT CONNECTIONS

END OF SECTION

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor motion sensors.

C. Outdoor photo controls.

D. Digital load controllers.

E. Lighting contactors.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260529 - Hangers and Supports for Electrical Systems

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260918 - Remote Control Switching Devices: Remotely controlled devices for lighting control, including networked lighting controls, programmable relay panels, and remote control switching relays.

F. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
   1. Includes finish requirements for wall controls specified in this section.

G. Section 265100 - Interior Lighting.

H. Section 265600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

A. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2020.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

F. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

G. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

J. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

K. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

L. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

M. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
   2. Coordinate placement of wall switch occupancy sensors with installed door swings.
   3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
   4. Coordinate placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement.
   5. Coordinate lighting control device product selections with luminaire characteristics; see Section 265100 and lighting fixture schedule.
   6. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

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

B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

C. Field quality control reports.

D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Product Evaluation and Listing Organization Qualifications: Organization engaged in evaluation of products and services, including those recognized by OSHA as Nationally Recognized Testing Laboratories (NRTL), and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

2.02 OCCUPANCY SENSORS

A. Manufacturers:

1. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. General Requirements:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
   3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
   4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
   5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
   7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
   8. Load Rating for Line Voltage Occupancy Sensors: As required to control load indicated on drawings.

C. Wall Switch Occupancy Sensors:
   1. General Requirements:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
      b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
      c. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.

D. Wall Dimmer Occupancy Sensors:
   1. General Requirements:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
      b. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
      c. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.

E. Ceiling Mounted Occupancy Sensors:
   1. General Requirements:
      a. Description: Low profile occupancy sensors designed for ceiling installation.
      b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
      c. Finish: White unless otherwise indicated.
   2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 square meters) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet (111.5 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.

3. Ultrasonic Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within area of 500 square feet (46.5 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
   b. Medium Range Sensors: Capable of detecting motion within area of 1,000 square feet (92.9 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
   c. Extended Range Sensors: Capable of detecting motion within area of 2,000 square feet (185.8 sq m) at mounting height of 9 feet (2.7 m).
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet (111.5 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet (111.5 sq m) at mounting height of 9 feet (2.7 m).

F. Power Packs for Low-Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.
2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control load indicated on drawings.

2.03 OUTDOOR MOTION SENSORS

A. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.

B. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.

C. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during adjustable turn-off delay time interval.

D. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.

E. Integral Photocell: For dusk to dawn operation.

F. Manual Override: Activated by switching power off to unit and then back on.

G. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.

H. Coverage: Capable of detecting motion within distance of 50 feet (15 m) at mounting height of 8 feet (2.4 m), with field of view of 270 degrees.

2.04 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
   1. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. Stem-Mounted Outdoor Photo Controls:
   1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
   2. Housing: Weatherproof, impact resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Provide external sliding shield for field adjustment of light level activation.
   5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
   6. Voltage: As required to control load indicated on drawings.
   7. Failure Mode: Fails to the on position.
   8. Load Rating: As required to control load indicated on drawings.

C. Button Type Outdoor Photo Controls
   1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
   2. Housing: Weather resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
   5. Voltage: As required to control load indicated on drawings.
   6. Failure Mode: Fails to the on position.
   7. Load Rating: As required to control load indicated on drawings.

2.05 DIGITAL LOAD CONTROLLERS

A. Manufacturers:
   1. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. System Description:
   1. Stand-alone system, including interconnected modules and accessories, for lighting and plug load low-voltage control as indicated on drawings, schedules, written sequences of operation, and reviewed shop drawings.
   2. Product standard system configurations preconfigured out of box, plug-and-play, automatically self-addressing devices for communications, and without need to field configure or program features, or requiring device setting adjustments. LEDs on unit indicate operation and troubleshooting without software intervention.
   3. Provide quantity and configuration of power and slave packs, communication modules, and load expansion modules, including associated wiring, wired and wireless components, and accessories to control loads indicated.

C. General Requirements:
   1. Listed for powering and controlling line-voltage loads, power packs, contactors, relays, and other lighting control devices.
   2. Input Supply Voltage: Dual rated for 120/277 VAC.
   3. Cabling Terminations:
      a. Include line and load wiring leads.
   4. Compatibility:
      a. Compatible with luminaires specified with integral sensors; include auxiliary contact closure accessory components for controls indicated.

5. Provide UL 2043 plenum rated control unit with self-contained relay(s) and low-voltage class 2 transformer, compatible with specified wired and wireless sensors, components, and ballasts/drivers.
    a. Comply with NFPA 70 for use in plenum spaces.
    b. Provide UL 2043 plenum rating for associated system control components for control indicated.
6. Surface Mounting: Standard junction box attachments.
7. Provide one auxiliary contact closure output where indicated.
8. Minimum Load Rating: As required to control load indicated on drawings.
9. Control Inputs:
    a. Digital: Two.
    b. Analog: One.
10. Output Control Capability:
    a. Single Zone Switching Modules: One programmable channel.
    b. Multi-Zone Switching Modules: Up to three separately programmable channels.

D. Additional Integrated Requirements forDigital Load Controllers:
1. Central Monitoring and Management: Include programmable user interface for lighting system controllable features; control access locally by plugging into devices and LAN network via browser-based software with settings retained in nonvolatile memory.
2. Provide additional auxiliary contact closure outputs where required for functions and operating modes indicated.
3. Scheduling:
    a. Include timer and clock configurator for full calendar year and daylight savings automatic adjustments based on time zone.
    b. Provide function for hold-on, designed within time limitations or other restrictions of presiding energy code.
    c. Demand Response: Load shed or hold-off capability.
4. Occupancy Controls:
    a. Scene Control: Occupant selections by lighting control devices for controls as indicated.
    b. Bi-level Switching: Multi-level lighting for controls as indicated.
    c. Dimming: Occupancy controlled dimming, including blink warning; 50 percent light-level after programmed delay time.
    d. Shade Control: Interfacing capability.
5. Daylight Harvesting:
    a. System Description:
        1) Control system with compatible control modules, power packs, contactors, or relays as required for automatic control of load indicated according to available natural light.
        2) System control responds to changes in measured light levels according to selected settings.
        3) Capable of integrating with daylighting sensors, occupancy sensors, and manual override controls.
    b. Daylighting Control Photo Sensors: Low-voltage class 2 photo sensor units with output signal proportional to measured light level and provision for zero or offset based signal.
        1) Sensor Type: Filtered silicon photo diode.
        2) Sensor Range:
            (a) Indoor Photo Sensors: 5 to 100 footcandles (53.8 to 1,080 lx).
        3) Finish: White unless otherwise indicated.
    c. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts/drivers, for direct continuous dimming of up to 50 ballasts/drivers.

d. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
e. Daylight Control Switching Modules: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with no-switching dead band between set points to prevent unwanted cycling.
f. Daylight Control Dimming Module Operation:
   1) Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
   2) Load to be turned off when available daylight is sufficient to fully dim load, after selected time delay.
   3) Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
   4) Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
   5) Output Voltage: Compatible with specified dimming ballasts/drivers.

6. Accessories:
   a. Where indicated, provide compatible accessory wall switches for manual override control.

2.06 LIGHTING CONTACTORS

A. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on drawings.

B. Short Circuit Current Rating:

C. Enclosures:
   1. Comply with NEMA ICS 6.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   3. Finish: Manufacturer's standard unless otherwise indicated.

2.07 ACCESSORIES

A. Auxiliary Contacts:
   1. Comply with NEMA ICS 5.
   2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

B. Control and Timing Relays:
   1. Comply with NEMA ICS 5.
   2. Provide number and type of relays indicated or required to perform necessary functions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.
   1. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
   2. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Maintain separation of remote-control, signaling, and power-limited circuits.
   1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 262726.

H. Provide required supports; see Section 260529.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

J. Occupancy Sensor Locations:
   1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into photo control.

M. Daylighting Control Photo Sensor Locations:
   1. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure light level controlled at designated task location, while minimizing measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
   2. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into space, while minimizing measured amount of lighting from artificial sources.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test outdoor photo controls to verify proper operation, including time delays where applicable.

E. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

A. See Section 019113 - General Commissioning Requirements for commissioning requirements.

3.08 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Location: At project site.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

2. Boxes: Galvanized steel unless otherwise indicated.
   a. Provide wiring gutters sized to accommodate the conductors to be installed.
3. Fronts:
   a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

K. Load centers are not acceptable.

2.02 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum.
   2. Ground Bus Material: Aluminum.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   4. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

2.04 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 260526.

I. Install all field-installed branch devices, components, and accessories.

J. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

K. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

L. Provide filler plates to cover unused spaces in panelboards.

M. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Fire detection and alarm circuits.
   2. Communications equipment circuits.
   3. Intrusion detection and access control system circuits.
   4. Video surveillance system circuits.

N. Identify panelboards in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates and covers.

E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 262723 - Indoor Service Poles.

E. Section 271000 - Structured Cabling: Voice and data jacks.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Project Record Documents: Record actual installed locations of wiring devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

B. Wiring Device Finishes:
   1. Provide wiring device finishes as described below, unless otherwise indicated.
   2. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
   3. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
   4. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
   5. Wiring Devices Installed in Wet or Damp Locations: White with weatherproof cover.
   6. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

2.02 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.03 WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Control: Slide control type with separate on/off switch.

C. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

2.04 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

C. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

2.05 WALL PLATES AND COVERS

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; _____.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.06 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.

B. Flush Floor Service Fittings:
   1. Dual Service Flush Combination Outlets:
      a. Cover: Rectangular.
      b. Configuration:
         1) Power: Two standard convenience duplex receptacle(s) with duplex flap opening(s).
         2) Communications: (2) 2-port.
         3) Voice and Data Jacks: As specified in Section 271000.
   2. Dual Service Flush Furniture Feed:
      a. Cover: Rectangular.
      b. Configuration:
         1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
         2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
   3. Accessories:
      a. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Dimmers: 48 inches (1200 mm) above finished floor.
      b. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

P. Identify wiring devices in accordance with Section 260553.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 262733 - POWER DISTRIBUTION UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution units (PDUs).

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NEMA PB 1 - Panelboards; 2011.

B. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

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

B. Product Data: Provide electrical characteristics and connection requirements for unit and accessories.

C. Project Record Documents: Record actual locations of components and cables.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect products from moisture and dust by storing them in a clean, dry location remote from areas involved in construction operations. Provide additional protection in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install until building finishes are complete.

B. Maintain temperature between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C) during and after installation of units.

C. Maintain relative humidity between 0 percent and 95 percent (noncondensing) during and after installation of units.

PART 2 PRODUCTS

2.01 POWER DISTRIBUTION UNITS

A. Power Distribution Unit: For data processing equipment, suitable for underfloor cable connection, providing surge protection, harmonic filters, isolation transformer, voltage regulation, and branch circuit overcurrent protective devices.

B. Service Conditions:
   1. Temperature: 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C).
   2. Humidity: Less than 95 percent humidity (non-condensing).
   3. Altitude: Less than 3,300 feet (1,000 meters) above sea level.

C. Ratings:
   1. Input Voltage Rating: 120/208 volts, 1 phase.
   2. Output Voltage Rating: 120/208 volts, 1 phase.
   3. Impedance: 3 percent, maximum.
   4. Input Voltage Limits: plus 10, minus 20 percent.

5. Frequency: 60 plus or minus 3 Hz.
6. Load Power Factor: Capable of operating between 60 percent lagging and 60 percent leading power factor.
7. Harmonic Distortion of Input Current Wave Form: 5 percent maximum at full load.
8. Output Voltage Regulation: plus 6, minus 8 percent.
9. Output Harmonic Distortion: Maximum 2 percent rms total harmonic distortion.
10. Response Time: 100 percent correction in 1 cycles.
11. Audible Noise: Less than 52 dBA at distance of 3 feet (1 m) in non-reverberating environment.
12. Efficiency: 90 percent minimum over operating range.
13. Normal Mode Attenuation: 32 dB, 10 Hz. to 1 MHz.
14. Common Mode Attenuation: 126 dB.

D. Isolation Transformer: NEMA ST 20, factory-assembled, air cooled dry type shielded isolation transformer, ratings to match unit ratings specified.

E. Branch Circuit Panelboard: NEMA PB 1, circuit breaker type, with bus ratings to match unit capacity specified. Provide copper ground bus and double capacity neutral bus.

F. Molded Case Circuit Breakers: Plug-in type thermal magnetic trip circuit breakers, with common trip handle for all poles; UL listed.

2.02 CONTROLS AND INDICATORS

A. Controls: AC input circuit breaker; INDICATOR TEST switch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide required support and attachment in accordance with Section 260529.

3.02 ADJUSTING

A. Adjust settings in accordance with manufacturer's instructions.

END OF SECTION

SECTION 262811.11 - MOLDED CASE / INSULATED CASE CIRCUIT BREAKERS - SCHNEIDER ELECTRIC SQUARE D POWERPACT / MASTERPACT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Molded case circuit breakers.

B. Insulated case circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 260160.13 - Maintenance Services for Electrical Distribution Equipment - Schneider Electric EcoCare.

1.03 ABBREVIATIONS AND ACRONYMS

A. MCCB: Molded case circuit breakers.

B. ICCB: Insulated case circuit breakers.

C. ERMS: Energy reduction maintenance setting.

D. HMI: Human machine interface.

1.04 DEFINITIONS

A. Operator Interface Terminal (OIT): Locally mounted HMI device that provides remote monitoring and functions of connected equipment.

1.05 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. IEC 61000-4-30 - Electromagnetic Compatibility (EMC) - Part 4-30: Testing and Measurement Techniques - Power Quality Measurement Methods; 2015, with Amendments (2021).

C. IEC 62443-3-3 - Industrial Communication Networks – Network and System Security – Part 3-3: System Security Requirements and Security Levels; 2013 (Corrigendum 2014).

D. IEC 62443-4-1 - Security for Industrial Automation and Control Systems – Part 4-1: Secure Product Development Lifecycle Requirements; 2018.

E. IEC 62443-4-2 - Security for Industrial Automation and Control Systems – Part 4-2: Technical Security Requirements for IACS Components; 2019.

F. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).

G. ISO 14001 - Environmental Management Systems — Requirements with Guidance for Use; 2015.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 70B - Recommended Practice for Electrical Equipment Maintenance; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

K. UL 5500 - Remote Software Updates; Current Edition Including All Revisions.

1.06 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1.07 QUALTIY ASSURANCE

A. Comply with the following:
   1. NFPA 70.
   2. Requirements of local authorities having jurisdiction.
   3. Applicable local codes.

B. Manufacturer Qualifications:
   1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 10 years.
   2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
   3. Service, repair, and technical support services available 24 hours per day, 7 days per week from manufacturer or their representative.
   4. Certified in accordance with ISO 14001, with product environmental profiles (PEPs) for specified products.

C. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.

B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.

C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.

D. Inspect products and report concealed damage or violation of delivery, storage, and handling requirements to Engineer.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 12 months from date of commissioning or 18 months from date of shipment, whichever comes first. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schneider Electric; Square D PowerPacT Molded Case Circuit Breakers and MasterPacT Insulated Case Circuit Breakers; www.se.com/#sle.

B. Source Limitations: Furnish products produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. Basis of Design: Schneider Electric; Square D PowerPacT Molded Case Circuit Breakers; www.se.com/#sle.

B. General Requirements:
   1. Comply with FS W-C-375; listed and labeled as complying with UL 489.
   2. Interrupting Rating: Available up to 200 kAIR without fuses.
   3. Available Frame Sizes:
      a. B-Frame: 125 A.
      b. H-Frame: 150 A.
      c. J-Frame: 250 A.
      d. Q-Frame: 225 A.
      e. L-Frame: 600 A.
      f. M-Frame: 800 A.
      g. P-Frame: 1,200 A.
      h. R-Frame: 3,000 A.
   4. Construct circuit breakers using glass-reinforced insulating material.
   5. Isolate current carrying components from handle and accessory mounting area.
   6. Provide over-center, trip-free, toggle operating mechanism for quick-make, quick-break contact action; provide common tripping of all poles.
   7. Frame Sizes 125 A to 600 A: Provide double rotary contact to limit let-through energy.
   8. Design circuit breaker to trip in event of high-level short-circuit currents, independent of thermal-magnetic or electronic trip unit.
   9. Construct circuit breakers using materials that are natively fungus resistant.
   10. Handle:
      a. Reside in tripped position between ON and OFF to provide local trip indication. Clearly mark circuit breaker escutcheon ON and OFF and provide international I/O markings.
      b. Frame Sizes 150 A to 600 A: Available Visi-Trip LED handle accessory to illuminate circuit breaker requiring attention without control wiring/separate power source; provides improved ergonomic handle operation.
   11. Cleary mark maximum ampere rating and certification standards with applicable voltage systems and interrupting ratings on face of circuit breaker.
   12. Laser engrave permanent, legible circuit breaker labelling that also serves as anti-counterfeiting measure.
   13. Provide push-to-trip button, located on face of circuit breaker, to mechanically operate circuit breaker tripping mechanism for maintenance and testing purposes.
   14. For circuit breakers that accept internal electrical accessories, provide front cover with translucent windows to view presence of auxiliary contacts without removing cover; for breakers greater than 600 A, include translucent window to view presence of accessory trip coils without removing cover.
   15. Provide factory seal with hologram quality mark or tamper-evident label with date code.
   16. Accommodate device for locking in isolated position.
   17. List circuit breaker/circuit breaker and fuse/circuit breaker combinations for series-connected interrupting ratings as recognized component combinations.
   18. Mark series-rated combination on end use equipment with statement "Caution - Series Rated System. _____ A Available. Identical Replacement Component is Required".
   19. Electronic Components: Withstand temperatures up to 221 degrees F (105 degrees C).
   20. Lugs:
      a. UL listed circuit breakers to accept field installable/removable mechanical lugs (except Type QB/QD/QG/QJ).
      b. UL listed to accept solid and/or stranded copper and aluminum conductors.

c. Suitable for:
1) 140 degrees F (60 degrees C) rated wire on 125 A circuit breakers and below.
2) 167 degrees F (75 degrees C) rated wire.
3) 194 degrees F (90 degrees C), sized in accordance with 167 degrees F (75 degrees C) temperature rating in NFPA 70.
d. Suitable for various connection methods, including compression lugs, power distribution connectors, or bus connections, with field-installable termination options.

21. Frame Sizes 250 A and Above: Fitted with metallic filters to reduce effects perceptible from outside during current interruption.
22. Provide circuit breakers of equal dimensions (width and height) for all amperages and AIR ratings within a given frame size.
23. P-Frame (1,200 A) Circuit Breakers:
a. Available in manually and electrically operated versions.
b. Electrically Operated: Stored-energy type only, equipped with anti-pumping function.

C. Trip Units:
1. Frame Size of 125 A: Provide thermal magnetic trip units.
2. Frame Sizes 150 A to 400 A: Provide electronic trip units.
3. Frame Sizes 400 A and Above: Provide electronic trip units.
4. Non-Interchangeable Trip Units: Circuit breakers to be UL listed for reverse connection without restrictive line and load markings; suitable for mounting in any position.
5. Field Interchangeable Trip Units: Easily interchangeable and easily secured to MCCB; circuit breakers equipped with safety interlock to keep circuit breaker open if trip unit is not installed.
6. Do not increase overall circuit breaker volume with addition of trip units.
7. H-, J-, and L-Frame Circuit Breakers: Provide proper torque to attachment screws via breakaway screw technology.
8. Thermal Magnetic Trip Unit.
a. Available for Q-, B-, H-, J-, LA-, and LH-frame circuit breakers rated 400 A and below.
b. Thermal Trip Elements: Factory preset and sealed; true RMS sensing and thermally responsive to protect circuit conductors in 104 degrees F (40 degrees C) ambient temperature.
c. Frame Sizes 250 A and Above: Provide single magnetic trip adjustment on front of circuit breaker.
d. Where indicated on drawings, provide ground fault module (GFM) with 20 A to 200 A sensitivity level or earth leakage module (ELM) with sensitivity range between 30 mA and 3 A.
9. Electronic Trip Unit; MicroLogic.
a. Available for H-, J-, L-, P-, and R-frame circuit breakers rated 15 A to 3,000 A.
b. Provide true RMS sensing.
c. Provide air core current transformers for accurate measurements from low currents up to high currents.
d. Provide thermal imaging to protect from intermittent short circuits or ground-faults.
e. Integral Monitoring Functions:
1) Provide test connector for checks on electronic and tripping mechanism operation using external device.
2) LED for load indication at 105 percent.
3) LED for load indication at 90 percent of load for applications 600 A and smaller.
4) LED for visual verification of protection circuit functionality for applications 600 A or smaller.
5) Support adjustment of protection settings to be set and read locally by rotating switch.

6) Long-Time Pickup: Support adjustment to nine long-time pickup settings from 0.4 to 1 times sensor plug (In), with finer adjustments available for more precise settings to match application.
7) Long-Time Delay: Support adjustment for nine bands at six times Ir, from 0.5 to 24 seconds above 600 A, and 0.5 to 16 seconds for 600 A and below.
8) Short-Time Pickup: Support adjustment to nine settings from 1.5 to 10 times Ir.
9) Short-Time Delay: Support adjustment for nine bands from 0.1 to 0.4 I2t ON and 0 to 0.4 I2t OFF.
10) Provide instantaneous settings on trip units with LSI protection, available in nine bands.
    (a) Above 600 A: From 2 to 15 times In.
    (b) 600 A: From 1.5 to 11 times In.
    (c) 400 A: From 1.5 to 12 times In.
    (d) 250 A and Below: From 1.5 to 15 times In.
11) Provide neutral protection for four-pole devices with three-position setting (neutral not protected, neutral tripping threshold equal to half phase value, and neutral threshold equal to phase value).
12) Ground Fault Settings:
    (a) Sensor Sizes 1,200 A and Below: Nine bands from 0.2 to 1.0 times In.
    (b) Sensor Sizes Above 1,200 A: Nine bands from 500 A to 1,200 A.

f. Support sealing of trip unit to prevent unauthorized access to settings in accordance with NFPA 70.
g. Provide local trip indication and capability to locally and remotely indicate reason for trip (e.g., overload, short circuit, and ground fault).
h. Available neutral current transformers for four-wire systems.
i. Support electronic adjustment of settings locally and remotely to fine increments below switch settings.
    1) Pickup Adjustments: 1 A increments.
    2) Delay Adjustments: 1 second increments.
j. Available real-time metering with the following functions according to model:
    1) Current: Phases, neutral, average, and maximum.
    2) Voltage: Phase-to-phase, phase-to-neutral, average, and unbalance.
    3) Power: Active (kW), reactive (kVAR), apparent (kVA), and power factor.
    4) Energy: Active (kWh), reactive (kVAR), and apparent (kVA).
    5) Frequency.
    6) Total Harmonic Distortion: Current and voltage.
    7) Metering Accuracy:
        (a) Specified as total system accuracy including CT and meter.
        (b) Current: 1 percent up to 600 A; 1.5 percent above 600 A.
        (c) Voltage: 0.5 percent.
        (d) Energy: 2 percent..
k. Provide measurement chain independent from protection chain.
l. Support display of measurements on breaker, remote display, and/or remote system via Modbus communication.
m. Provide plug-and-play RJ45connectors for connections from circuit breaker to remote display and/or communication module without requiring special tools or programming.

D. Communicating Circuit Breaker Interface to Monitor, Control, and Maintain Electrical Equipment:
    1. Provide communicating interface to support monitoring and control of protection units with information on status, to deliver maintenance and equipment information using open protocol including Modbus TCP/IP or Modbus RS485 serial line.
        a. Energy Cost Management: Energy saving and optimization.

b. Electrical Distribution Network Management: Protection, monitoring, and control.
c. Asset Management: Use optimization, predictive maintenance, and equipment alarming.
d. Transmit data to BMS or FTP server.

2. Provide Ethernet TCP/IP 10/100 Mbps ports for connection to building local area network (LAN) and real-time access to device data with standard internet web browser.
3. Characteristics, Operating Principle, and Indications:
   a. Provide access to the following information for circuit breakers at all layers of electrical distribution architecture (main/incoming circuit breakers down to modular feeders):
      1) Circuit Breaker Status: ON/OFF position (O/F), trip indication (SD), and fault-trip indication (SDE).
      2) Circuit Breaker Position Within Cradle: Connected, test, and disconnected.
   b. Support open, close, and reset commands, taking into consideration current condition of circuit breaker (e.g., cell position, mechanical status).
   c. When advanced trip units are used, provide access to the following information:
      1) Instantaneous and demand values, maximum and minimum values, energy metering, demand current and power, and power quality.
      2) Protection and alarm settings.
      3) Time-stamped trip and alarm histories and event tables.
      4) Maintenance indicators.
4. Communicating Circuit Breaker Interfaces Functions:
   a. Energy Management System: Provide main interface and secondary interfaces for energy management.
   b. Collect data via Ethernet TCP/IP and ModBus network connections to communicating circuit breakers, I/O digital and analog input modules, pulse counter, and power meter/energy meter.
   c. Ethernet Communication Interfaces: Comply with Device Profile for Web Services (DPWS) for discovery on local area network (LAN).
      1) Energy management Interface: Provide direct access to data collection to monitor and control devices and load.
      2) Data Collected:
         (a) Data from communicating circuit breakers with embedded measurement capability.
         (b) Pulse from metering pulse electrical, gas, and water counters.
         (c) Data from communicating energy meters or power meters.
         (d) Logic state of technical devices or equipment.
         (e) Device alarms with time logs.
         (f) Temperature analog sensor value.
      3) Data Displayed Via Web Pages:
         (a) Energy consumption.
         (b) Electrical data network monitoring.
         (c) Alarms and events.
         (d) Energy quality monitoring.
         (e) Equipment or devices status (open, close, tripped, NA), indication of fault types (LT, ST, instantaneous, ground fault), faulty phases, and interrupted current.
         (f) Operation and predictive maintenance monitoring.
      4) Functions Controlled Via Web Pages:
         (a) Load and devices via digital output.
         (b) Orders of actuator.
5. Communicating Circuit Breaker Interface Features:

a. Main Interface: Enables intelligent modular unit (IMU), for air or molded case circuit breakers to be connected to Ethernet network and enables gateway to Modbus serial line connection.
b. Intelligent Modular Unit: Mechanical and electrical assembly containing one or more products to perform function in equipment (incoming protection, motor command, and control); installed in equipment.
c. Main Interface Features:
    1) Dual Ethernet port for simple daisy chain connection.
    2) Device Profile for Web Services (DPWS) for discovery on local area network (LAN).
    3) Dual universal logic plug (ULP) for advanced connection with air or molded case circuit breaker.
    4) Gateway for Modbus-SL connected devices.
    5) Embedded set-up web pages.
    6) Embedded monitoring web pages.
    7) Embedded control web pages.
    8) Built-in email alarm notification.
    9) Mounting on DIN rail.
    10) Provide stacking accessory that supports connection of several Modbus interfaces for air or molded case circuit breaker without additional wiring.
    11) Provide 24 VDC to interface using listed limited voltage/limited current or Class 2 power supply with 3 A maximum.
    12) Interface provides DC supply to Modbus interfaces for air or molded case circuit breaker; separate supply not required.
    13) Indicate status of interface, Ethernet communication dual color ports, universal logic plug (ULP) and Modbus connections with LED on front panel.
    14) Provide locking pad on front panel of interface to enable/disable sending remote control commands over Ethernet network, and to other modules of connected intelligent modular unit (IMU).
    15) Support addition of new functions to intelligent modular unit (IMU) using pre-defined applications:
        (a) Selection by application rotary switch on I/O application module, defining application with pre-defined input/output assignment and wiring diagram.
        (b) No additional setting with customer engineering tool required; resources not assigned to pre-defined application are free for additional user-defined applications, including cradle management, breaker operation, energy reduction maintenance setting (ERMS), light and load control, and custom protection/control/energy management/monitoring.
    16) Support updating firmware using FTP connection or customer engineering tool.

6. Equipment Display:
    a. Provide integrated equipment display for energy management system connected to equipment interface via Ethernet TCP/IP network.
    b. Support real-time display monitoring of devices.
    c. Support simple control of devices and load.
    d. Monitored Functions:
        1) Energy consumption.
        2) Electrical network data.
        3) Alarms and events.
        4) Energy quality.
        5) Equipment/device status (open, close, tripped, NA), indication of fault types (LT, ST, instantaneous, ground fault), faulty phases, and interrupted current.

6) Predictive maintenance monitoring contact wear rate, load profile, and circuit breaker counter values.

7. Operating and Installation Principles:
   a. Applications Requiring Multiple Communicating Interfaces:
      1) Optimize interface enabling communication with monitoring system (outside equipment) using Modbus TCP/IP where applicable.
      2) Interconnect device interfaces with Modbus RS485 SL daisy chaining inside equipment, using stackable connectors.
      3) Position device interfaces on DIN rail for quick viewing of network set up and status.
      4) Provide plug-in type input/output application module for communicating interface.
      5) Where possible, provide prefabricated interface/device links with RJ45 connectors for connection to interface in single operation with no risk of error.
   b. Operation of Communication Interface:
      1) Support integration into communication network with automatic adaptation of communication parameters to match network.
      2) Provide data to supervisor in Modbus tables, at fixed addresses that require no configuration.
      3) Concentrators: Support receiving from supervisor, by writing in Modbus table at fixed addresses.
      4) Support execution of orders by control devices, after considering current device positions.
      5) Support monitoring and control of auxiliaries and devices using integrated web page.
      6) Support monitoring of analog temperature sensors.
   c. Testing of System:
      1) Manufacturer to supply software tool to test system; include data transmission and control chain between modular devices and concentrators, including communication.
      2) Supply report that includes list of devices connected to each channel of data concentrators and diagram describing configuration of system with indication of associated Modbus addresses.
   d. Operation and Maintenance:
      1) Product Measurement and Communication Capability:
         (a) Status of Circuit Breaker Operations: Open/Close/Tripped/NA.
         (b) Indication of fault types (LT, ST, instantaneous, ground fault), faulty phases, and interrupted current.
         (c) Trips history.
         (d) Alarms history.
         (e) Events history (e.g., setting changes and tests).
         (f) Available via remote display, communication, or engineering tool.
      2) Main Interface Web Pages and Equipment Display Capabilities:
         (a) Execute one or more reset commands per device type.
         (b) Control the following applications remotely:
            (1) Circuit Breaker Operations: Open/Close.
            (2) Reset input counters, reset output counters, light control, load control, and user-defined output control.
         (c) Access the following maintenance log information:
            (1) Date and time entry was made and name of user that made it.

(2) Maintenance counter information for selected device, including, circuit breaker operation counters, trip and alarm counters, load profile, contact wear counters, and cradle counters.

(d) Send and display the following alarms:
(1) Activate alarms based on measurement (I, V, F, P, Q, S, THD, CosPhi, FP, Idemand, Pdemand,) or counters.
(2) Time-stamp alarms.
(3) Support activation of digital output for local indication.
(4) Available via remote display, communication, or engineering tool.

2.03 INSULATED CASE CIRCUIT BREAKERS

A. General Requirements:
1. Listed as complying with UL 489.
2. Provide sealed insulated case power circuit breaker (ICCB), manually operated, with integrally mounted electronic trip units.
3. Mounting: Fixed mounted.
4. Circuit Breaker Rating: 80 percent rated except where indicated to be 100 percent.
5. Interrupting Rating: Available up to 100 kAIR RMS at 600 V, 150 kAIR RMS at 480 V, and 200 kAIR RMS at 240 V without fuses.
6. Thirty-Cycle Withstand Ratings: Comply with application requirements.
7. Close-and-Latch Rating: Up to 90 kA peak current.
8. Maximum Closing Time:
a. Provide maximum 5-cycle closing time.
b. Ratings Less than 1,600 A: 50 milliseconds.
c. Ratings Between 1,600 A and 4,000 A: 70 milliseconds.
d. Ratings Greater than 4,000 A: 80 milliseconds.
9. Service Life:
a. Frame Size of 3,000 A or Less: Certified for 10,000 operations without maintenance.
b. Frame Size Greater than 3,000 A: Certified for 5,000 operations without maintenance.
c. Provide visual contact wear indicator.
10. Operation:
a. Provide two-step, fully-stored energy devices for quick-make, quick-break operation.
1) Capable of open-close-open cycle without recharging.
2) Automatically charge motor operator when breaker is closed.
3) Step One: Actuation of operating handle or operation cycle of circuit breaker motor charges closing springs.
4) Step Two: Operation of local close button closes circuit breaker contact, automatically charging opening springs.
b. Anti-Pumping Function: Remains in open position if opening/closing commands occur simultaneously; after fault tripping or intentional opening using manual or electrical controls, requires closing order to be discontinued and reactivated.
c. Provide OPEN and CLOSE buttons with lockable clear cover.
d. Provide breaker contact and close spring status indicators; indicate "charged-not OK to close" if closing springs are charged but circuit breaker is not ready to close.
e. Locking Provisions: For locking in connected, test, or disconnected position.
1) Pad-Lock Provisions: One to three.
2) Key-Lock Provisions: One to two.
f. Provide safety interlock to keep circuit breaker open if trip unit is not installed.
g. Shunt Trip and Shunt Close Coils: Continuous-duty rated; intermittent duty rated coils dependent on coil clearing contact may be used where spare coil is provided for each breaker.

11. Construction:
    a. Case: Polyester thermoset material with high dielectric strength.
    b. Current-Carrying Components: Isolated from accessory mounting area and double-insulated from operator with accessory cover in place.
    c. Isolate each phase and ground.
    d. Equipped with metal filters to reduce effects of interruption on surfaces surrounding circuit breaker.
    e. Secondary Wiring: Front accessible with cage clamp connections.
    f. Comply with Registration Evaluation and Authorization and Restriction of Chemicals (REACH) and Restriction of Hazardous Substances (RoHS).

B. Electronic Trip Units:
1. Digital Modules:
    a. Provide capability to upgrade trip unit functions by uploading digital modules without requiring replacement/modification of hardware.
    b. Electronically manage trip unit protection functions independently of measurement functions by dedicated application-specific integrated circuit (ASIC).
    c. Support uploading of digital modules to trip unit without removing power from circuit breaker.
2. Provide local and remote trip indication with cause of trip (e.g., overload, short circuit, or ground fault).
3. Visually indicate circuit breaker operating status (normal, warnings, alarms, energy reduction maintenance setting) via color-changing backlit display.
4. Provide capability to set breaker locally, via smart mobile device, or remotely through communications.
5. Provide sealable door to block use of local display for deterrence of unwanted protection setting changes.
6. Support extraction of trip cause data from trip unit and adjustment of protection settings without 24 VDC power supply or when main circuit breaker is OFF using portable power supply connected through USB port, including battery pack, smart mobile device (USB OTG), or laptop PC.
7. Provide true RMS sensing through 40th harmonic; indicate long-time pickup with LEDs.
8. Coils: Provide status, self-diagnostics (functionality and number of coil operations), and wiring diagnostics. Coils without these features to be provided with separate system to communicate status/alarms to remote monitoring system.
9. Where indicated on drawings, provide electronic trip units with the following field-adjustable protection settings:
    a. Long-Time (ANSI 49RMS/51):
        1) Pickup: Adjustable from 40 to 100 percent of nominal current rating in 1 A increments; where 1 A increments are not possible, provide complete set of rating plugs for each breaker.
        2) Delay: Adjustable from 0.5 to 24 seconds at 600 percent of long-time pickup in 0.5-second increments.
    b. Instantaneous (ANSI 50):
        1) Pickup: Adjustable from 150 percent to 1,500 percent of nominal current rating.
        2) Selectable Breaking Times:
            (a) Standard: For selective coordination.
            (b) Fast: For limiting let-thru energy; between 25 and 30 milliseconds.
10. Provide dual trip curve settings for each protection function (LSIG) with separate settings for utility, generator set, or grid sources; selectable by digital input through I/O module, Ethernet, or local display.
11. Energy Reduction Maintenance Setting (ERMS):

a. Trip Unit: Provide separate trip curve for arc energy reduction maintenance setting selected via physical selector switch or smart mobile device; operate in fast instantaneous trip mode (25 to 30 milliseconds), when trip curve is active.
b. Provide remote indicator light to indicate trip unit is in ERMS mode.

12. Measurement and Analysis Functions:
    a. Provide trip unit embedded measurement for real-time metering. Where trip unit embedded measurement is not available, provide external meter.
    b. Metering Accuracy:
        1) Current and Voltage: 0.5 percent.
        2) Power and Energy: 1 percent.
        3) Specified accuracies are for total measurement system, including CT and meter.
        4) Full scale over range of 10 to 120 percent of long-time pickup.
    c. Energy Measurement:
        1) Imported and exported energy on each phase of power system network.
        2) Active, reactive, and apparent energy, per phase and total.
    d. Harmonic Analysis and Waveform Capture: Individual harmonics of voltages and currents up to 40th harmonic, calculated every 200 milliseconds in accordance with IEC 61000-4-30.
    e. Support display of measurements on breaker HMI display, smart mobile device via Bluetooth, connected remote operator interface terminal, or remote monitoring system via Modbus TCP/IP.
    f. Event Management:
        1) Provide event management to assist in compliance with NFPA 70B.
        2) Provide notification of alarms and traceability, including event history of trips, protection setting changes, diagnostics, metering, configuration, and operation.
        3) Record date and time entry was made and user ID associated with change.
        4) Support alarm activation based on measurement or counters.
        5) Support availability of events by communication via Bluetooth and Modbus TCP/IP or by software engineering tool.
    g. Internal Monitored Functions:
        1) Circuit Breaker: Coil electrical continuity checks, circuit breaker closing time, gear motor charging time, circuit breaker closing and opening counter, circuit breaker time stamp closing and opening history log.
        2) Trip Unit: Internal sensor continuity (CTs), external sensor disconnection (ENCT, ground-fault sensor, I/O modules), internal failure discrimination (ASIC, sensor plugs, internal battery, trip solenoid), wireless communication failure (Bluetooth low energy, Ethernet).
13. Smart Mobile Device App:
    a. Communicate trip cause information to smart mobile device without requiring power to trip unit.
    b. Provide virtual assistance in reclosing breaker after trip event utilizing information extracted from breaker, including waveform capture on trip event.
    c. Display circuit breaker event information, potential trip causes, list of additional investigations needed to determine if power can be restored, and recommendations for power restoration.
14. Auto-Test Function: Monitor and communicate trip unit state, battery state, contact state, circuit breaker remaining life estimate (algorithm based), opening/closing function, and spring charging function; indicate by health state LED, embedded HMI display, and smart mobile device app.
15. Support remote open/close operation via wired communication or smart mobile device that delivers instructions based on ready-to-close, coil, and spring charging status.
16. Communications:

a. Provide USB communication/test port to check electronic and trip mechanism operation without requiring manufacturer's special hardware tool.
b. Provide wireless communication interface for protection settings and health checks using near field communications (NFC) and Bluetooth low energy (BLE) protocols.
c. Provide communication interface with two Modbus TCP/IP 10/100 Mbps ports (dual-port, single network) for connection to Ethernet network for real-time access to data and settings.
d. Provide embedded web page interface accessed via standard PC and web browser without requiring additional hardware or software.
e. Comply with Device Profile for Web Services (DPWS) for auto-discovery on local area network (LAN).
f. Capable of reporting drawout circuit breaker cradle position, viewable in embedded web page and over data connection to external monitoring software.
g. Trip unit and communication accessories for all Ethernet network accessible LV circuit breakers shall comply with cyber security global standards such as ISA/IEC 62443-4-1, ISA/IEC 62443-4-2, US cyber security regulations SB327, HB2395, NFPA 70 (NEC) 240.6 (D), UL 5500, DODI 8510.01, US data privacy regulations, and shall be part of a certified ISA/IEC 62443-3-3 reference architecture.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine equipment exterior and interior for damage, including but not limited to, structure, moisture, and mildew.

B. Examine for conditions detrimental to completion of work.

3.02 INSTALLATION

A. Install circuit breakers in accordance with manufacturer’s written instructions.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.
   1. Include necessary material, equipment, labor, and technical supervision.
   2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.

3.04 MAINTENANCE

A. See Section 260160.13 for additional information.

B. Provide to Owner, as alternate to base bid, separate contract for switchgear service plan for two years from date of Substantial Completion including, but not limited to, dedicated customer success management team, priority remote and on-site (within 100 miles (160 km) of service location) expert support, discounted service rates, continuous monitoring and alarming, online training.

END OF SECTION

SECTION 262813 - FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 RELATED REQUIREMENTS

A. Section 262816.16 - Enclosed Switches: Fusible switches.

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
      a. Fusible Enclosed Switches: See Section 262816.16.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Feeders:
   1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

B. Individual Motor Branch Circuits: Class RK1, time-delay.

2.02 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 262816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

D. Project Record Documents: Record actual locations of enclosed switches.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

L. Heavy Duty Switches:
   1. Comply with NEMA BS 31047.
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

M. General Duty Switches:
   1. Conductor Terminations:
      a. Provide mechanical lugs.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

N. Provide the following features and accessories where indicated or where required to complete installation:
   1. Hubs: As required for environment type; sized to accept conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 263213 - ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 231113 - Facility Fuel-Oil Piping:
   1. Diesel fuel piping.

C. Section 235100 - Breechings, Chimneys, and Stacks: Engine exhaust piping.
   1. Includes installation of exhaust silencer specified in this section.

D. Section 260526 - Grounding and Bonding for Electrical Systems.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for the seismic qualification of equipment specified in this section.

G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

I. Section 263600 - Transfer Switches.

1.03 REFERENCE STANDARDS

A. ASTM D975 - Standard Specification for Diesel Fuel; 2023a.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

D. NEMA MG 1 - Motors and Generators; 2021.

E. NFPA 30 - Flammable and Combustible Liquids Code; 2024.

F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2024, with Amendment.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 99 - Health Care Facilities Code; 2024, with Errata.

I. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.

J. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.

K. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

L. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 263600.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
1. Include generator set sound level test data.
2. Include characteristic trip curves for overcurrent protective devices upon request.
3. Include alternator thermal damage curve upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
1. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Derating Calculations: Indicate ratings adjusted for applicable service conditions.

F. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.

G. Specimen Warranty: Submit sample of manufacturer's warranty.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

I. Manufacturer's factory emissions certification.

J. Manufacturer's certification that products meet or exceed specified requirements.

K. Source quality control test reports.

L. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
1. Certified prototype tests.
2. Torsional vibration compatibility certification.
3. NFPA 110 compliance certification.
4. Certified rated load test at rated power factor.

M. Manufacturer’s detailed field testing procedures.

N. Field quality control test reports.

O. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

P. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

Q. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

R. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Fuses: One of each type and size.
3. Extra Filter Elements: One of each type, including fuel, oil and air.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
   3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
   4. NFPA 30 (Flammable and Combustible Liquids Code).

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   1. Authorized service facilities located within 200 miles (320 km) of project site.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Optional Standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).
   3. Total System Power Rating: 125 kW, standby, including applicable derating adjustments.

D. Packaged Engine Generator Set:
   1. Type: Diesel (compression ignition).
   2. Voltage: 208Y/120 V, 3 phase, 60 Hz.
   3. Main Line Circuit Breaker:
      a. Type: Thermal magnetic.
      b. Trip Rating: 400 amps.

E. Generator Set General Requirements:
   1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
   2. Factory-assembled, with components mounted on suitable base.
   3. List and label engine generator assembly as complying with UL 2200.
   4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
   6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Seismic Qualification: Provide engine generator assemblies and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.

G. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
   1. Altitude: 3500 feet (_____ m).

H. Starting and Load Acceptance Requirements:
   1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
   2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
   3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
   4. Maximum Load Step: Supports 100 percent of rated load in one step.

I. Exhaust Emissions Requirements:
   1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
   2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.02 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Diesel (Compression Ignition):
   1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
   2. Fuel Storage: Sub-base fuel tank.
   3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.
   4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
   5. Sub-Base Fuel Tank:
      a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.
      b. Tank Capacity: Size for minimum of 72 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.
      c. Features:

1) Direct reading fuel level gauge.
2) Normal atmospheric vent.
3) Emergency pressure relief vent.
4) Fuel fill opening with lockable cap.
5) Dedicated electrical conduit stub-up area.

C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
2. Battery(s):
a. Battery Type: Lead-acid.
b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
4. Battery Charger:
a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
c. Listed as complying with UL 1236.
d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
f. Provide alarm output contacts as necessary for alarm indications.
5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.03 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
   1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
   2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
   3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.04 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:
   1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
   2. Generator Set Control Functions:
      a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
      b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
      c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
      d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
      e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
      f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
      g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
   3. Generator Set Status Indications:
      a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
      b. Current (Amps): For each phase.
      c. Frequency (Hz).
      d. Real power (W/kW).
      e. Reactive power (VAR/kVAR).
      f. Apparent power (VA/kVA).
      g. Power factor.
      h. Duty Level: Actual load as percentage of rated power.
      i. Engine speed (RPM).
      j. Battery voltage (Volts DC).
      k. Engine oil pressure.
      l. Engine coolant temperature.
      m. Engine run time.
      n. Generator powering load (position signal from transfer switch).
   4. Generator Set Protection and Warning/Shutdown Indications:

a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
   1) Overcrank (shutdown).
   2) Low coolant temperature (warning).
   3) High coolant temperature (warning).
   4) High coolant temperature (shutdown).
   5) Low oil pressure (shutdown).
   6) Overspeed (shutdown).
   7) Low fuel level (warning).
   8) Low coolant level (warning/shutdown).
   9) Generator control not in automatic mode (warning).
   10) High battery voltage (warning).
   11) Low cranking voltage (warning).
   12) Low battery voltage (warning).
   13) Battery charger failure (warning).
b. In addition to NFPA 110 requirements, provide the following protections/indications:
   1) High AC voltage (shutdown).
   2) Low AC voltage (shutdown).
   3) High frequency (shutdown).
   4) Low frequency (shutdown).
   5) Overcurrent (shutdown).
c. Provide contacts for local and remote common alarm.
d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
   a. Event log.

C. Remote Annunciator:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Generator Set Status Indications:
   a. Generator powering load (via position signal from transfer switch).
   b. Communication functional.
3. Generator Set Warning/Shutdown Indications:
   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).
      5) Low oil pressure (shutdown).
      6) Overspeed (shutdown).
      7) Low fuel level (warning).
      8) Low coolant level (warning/shutdown).
      9) Generator control not in automatic mode (warning).
      10) High battery voltage (warning).
      11) Low cranking voltage (warning).
      12) Low battery voltage (warning).
      13) Battery charger failure (warning).
   b. Provide audible alarm with silence function.
   c. Provide lamp test function that illuminates all indicator lamps.

D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.05 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

J. Enclosure Space Heater: Provide thermostatically controlled enclosure space heater to prevent condensation and improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

2.06 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

C. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch (150 mm) high concrete pad constructed in accordance with Section 033000.

F. Provide required support and attachment in accordance with Section 260529.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide diesel fuel piping and venting in accordance with Section 231113, where not factory installed.

I. Provide engine exhaust piping in accordance with Section 235100, where not factory installed.

1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
2. Do not exceed manufacturer's maximum back pressure requirements.

J. Install exhaust silencer in accordance with Section 235100, where not factory installed.

K. Provide grounding and bonding in accordance with Section 260526.

L. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

E. Preliminary inspection and testing to include, at a minimum:
1. Inspect each system component for damage and defects.
2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
3. Check for proper oil and coolant levels.

F. Prepare and start system in accordance with manufacturer's instructions.

G. Perform acceptance test in accordance with NFPA 110.

H. Inspection and testing to include, at a minimum:
1. Verify compliance with starting and load acceptance requirements.
2. Verify voltage and frequency; make required adjustments as necessary.
3. Verify phase sequence.
4. Verify control system operation, including safety shutdowns.
5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).
6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

I. Provide field emissions testing where necessary for certification.

J. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.

K. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

L. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Instructor: Manufacturer's authorized representative.
3. Location: At project site.

E. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.06 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

END OF SECTION

SECTION 263323 - CENTRAL BATTERY EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Standard-transfer interruptible power supply (IPS) centralized emergency lighting inverters.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for the seismic qualification of equipment specified in this section.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 265100 - Interior Lighting:

1.03 REFERENCE STANDARDS

A. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 416 - Recommended Practice for Installing Energy Storage Systems (ESS); 2016.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 111 - Standard on Stored Electrical Energy Emergency and Standby Power Systems; 2025.

I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

J. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of centralized emergency lighting inverters to be installed with work provided under other sections or by others.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   3. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
   1. Where applicable, include characteristic trip curves for overcurrent protective devices upon request.
   2. Indicate any inverter load restrictions.
   3. Identify mounting conditions required for equipment seismic qualification.

C. Shop Drawings: Indicate dimensions, input/output voltages, power ratings, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, and installed features and accessories.

D. Derating Calculations: Indicate ratings adjusted for applicable service conditions and/or inverter load restrictions.

E. Specimen Warranty: Submit sample of manufacturer's warranty.

F. Evidence of qualifications for manufacturer.

G. Manufacturer's equipment seismic qualification certification.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

I. Manufacturer's certification that products meet or exceed specified requirements.

J. Source quality control test reports.

K. Provide NFPA 111 required documentation from manufacturer where requested by authorities having jurisdiction.

L. Manufacturer’s detailed field testing procedures.

M. Field quality control test reports.

N. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

O. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

P. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

Q. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Enclosure Keys: Two of each different key.
   3. Battery Fuses: See Section 262813 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 101 (Life Safety Code).
   3. NFPA 111; meet requirements for Level 1 system.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   1. Authorized service facilities located within 200 miles (320 km) of project site.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to inverter system components, enclosure, and finish.

D. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Inverter Assemblies: Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

C. Batteries: Provide pro-rata warranty for the duration of rated design life.

PART 2 PRODUCTS

2.01 CENTRALIZED EMERGENCY LIGHTING INVERTERS - GENERAL REQUIREMENTS

A. Provide complete centralized emergency lighting inverter system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Inverter Assemblies: Manufactured units consisting of inverters, batteries, enclosures, and associated components specifically designed for emergency lighting applications; microprocessor-based utilizing pulse width modulation (PWM) with insulated gate bipolar transistors (IGBT's); listed and labeled as complying with UL 924.
   1. Battery Run Times of 90 Minutes: Listed as complying with UL 924 for "emergency lighting and power equipment".
   2. Battery Run Times Other than 90 Minutes: Listed as complying with UL 924 for "auxiliary lighting and power equipment".

D. Provide inverters and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
   1. Altitude: 3500 feet (_____ m).

E. Increase indicated power ratings as required to accommodate any applicable inverter load restrictions.

F. Inverters Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.

G. Battery System:
   1. Provide battery capacity as required for achieving battery run time indicated.
   2. Battery Charger: Microprocessor-controlled, temperature compensated; capable of returning supplied battery(s) from fully discharged to fully charged condition within time required by NFPA 111 and UL 924 unless otherwise indicated.
   3. Provide automatic low voltage battery disconnect to prevent battery "deep discharge" damage.

H. Seismic Qualification: Provide emergency lighting inverters and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.

I. Enclosures:
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
   2. Hinged Doors: Lockable, with all locks keyed alike.
   3. Finish: Manufacturer's standard unless otherwise indicated.

J. Short Circuit Current Rating: Provide inverter assemblies with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

K. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category B.

L. Automatic Sequence of Operations:
   1. Upon failure or degradation of primary/normal input power, transfer load to battery power.
   2. When primary/normal input power has been restored, retransfer load to primary/normal power and recharge battery.

M. Input Tolerance:
   1. Voltage Range: Plus 10/minus 15 percent of nominal.
   2. Frequency Range: Plus/minus 2.5 percent of nominal.
   3. Total Harmonic Distortion (THD): 3 percent maximum at full load.

N. Output Requirements:
   1. Voltage Regulation: Plus/minus 3 percent.
   2. Frequency Range: Plus/minus 0.5 Hz.
   3. Total Harmonic Distortion (THD): 3 percent maximum for linear load.
   4. Load Power Factor Capability: From 0.8 lagging to 0.8 leading.

O. Features (Units 500 VA and Larger):
   1. Control Functions:
      a. Automatic mode.
      b. Manual Test Mode: Simulates failure of primary/normal source.
      c. Automatic Shutdown Mode (IPS Inverters Only): Upon applicable inverter circuit trouble/fault unit shuts down.
      d. Manual Bypass Mode: Manual bypass switch removes unit from circuit and delivers power directly from primary/normal source to load for unit maintenance purposes.
      e. Self-testing/self-diagnostics.
   2. Status Indications:
      a. Connected to primary/normal source.
      b. Connected to battery power.
      c. Primary/normal source available.
      d. Battery charging.
      e. Unit in manual bypass mode.
   3. Alarm Indications:
      a. Output overload/overcurrent.
      b. High temperature.
      c. Low battery.
   4. Other Features:
      a. Input circuit breaker.
      b. Event log.

2.02 STANDARD-TRANSFER INTERRUPTIBLE POWER SUPPLY (IPS) CENTRALIZED EMERGENCY LIGHTING INVERTERS

A. Manufacturers:
   1. Source Limitations: Furnish inverter assemblies and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: Offline/standby type inverters with maximum 50 ms transfer time to battery power source upon loss of normal power source; suitable for operation of incandescent, LED, and fluorescent light sources (not suitable for HID light sources).

C. Standard-Transfer Interruptible Power Supply (IPS) Centralized Emergency Lighting Inverter INV:
   1. Nominal Input/Output Voltage: 120 VAC, _____ -phase, _____ -wire (plus ground) input/output.
   2. Nominal Power Rating: 1600 kVA/kW.
   3. Battery Type: Valve-regulated lead acid (VRLA)/sealed lead calcium with 3 year design life.
   4. Battery Run Time at Full Output: 90 minutes.
   5. Output Circuit Breaker(s):
      a. 4 20 A, normally on, supervised.
   6. Features:
      a. Provide internal or external manual bypass switch.

2.03 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on inverter assemblies at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of inverter assemblies are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive inverter assemblies.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install inverter assemblies in accordance with applicable requirements of NECA 416.

C. Install products in accordance with manufacturer's instructions.

D. Provide required seismic controls in accordance with Section 260548.

E. Install inverter assemblies plumb and level.

F. Unless otherwise indicated, mount floor-mounted inverter assemblies on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

G. Provide grounding and bonding in accordance with Section 260526.

H. Identify inverter assemblies and associated system wiring in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank.

E. Prepare and start system in accordance with manufacturer's instructions.

F. Perform acceptance test in accordance with NFPA 111.

G. Inspect and test in accordance with NETA ATS, except Section 4.

H. Perform inspections and tests listed in NETA ATS, Section 7.22.2.

I. Batteries and Charger: Perform inspections and tests listed in NETA ATS, Section 7.18.

J. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of emergency lighting inverter system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of emergency lighting inverter system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Location: At project site.

3.06 PROTECTION

A. Protect installed inverter assemblies from subsequent construction operations.

END OF SECTION

SECTION 263353 - STATIC UNINTERRUPTIBLE POWER SUPPLY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Inverter units.

B. Batteries.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for the seismic qualification of equipment specified in this section.

1.03 REFERENCE STANDARDS

A. IEEE 519 - IEEE Standard for Harmonic Control in Electric Power Systems; 2022.

B. NEMA PE 1 - Uninterruptible Power Systems (UPS) - Specification and Performance Verification; 2012 (Reaffirmed 2017).

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate electrical characteristics and connection requirements. Provide battery rack dimensions; battery type, size, dimensions, and weight; detailed equipment outlines, weight, and dimensions; location of conduit entry and exit; single-line diagram indicating metering, control, and external wiring requirements; heat rejection and air flow requirements.
   1. Identify mounting conditions required for equipment seismic qualification.

C. Product Data: Provide catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements.

D. Manufacturer's equipment seismic qualification certification.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product. Include equipment installation outline, connection diagram for external cabling, internal wiring diagram, and written instruction for installation.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Operation Data: Description of operating procedures.

H. Maintenance Data: Description of servicing procedures; list of major components; recommended remedial and preventive maintenance procedures; spare parts list.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment from extreme temperature and humidity by storing in a conditioned space.

B. Protect equipment from dust and debris by wrapping unit in dusttight cover and storing away from construction activity.

C. Deliver batteries no sooner than 7 days before charging.

1.07 FIELD CONDITIONS

A. Do not store or install unless temperature is maintained between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C), at a relative humidity less than 95 percent (non-condensing).

B. Maintain conditions during and after installation of products.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty including coverage for batteries.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Uninterruptible Power Supply (UPS) System:
   1. ABB: www.electrification.us.abb.com/#sle.
   2. Eaton Corporation: www.eaton.com/#sle.
   3. Schneider Electric: www.se.com/#sle.

2.02 UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEMS

A. System Configuration: Non-redundant type with reverse transfer.

B. Components:
   1. Battery.
   2. Rectifier/charger to maintain battery charge and to provide input to inverter when utility power is available.
   3. Inverter to provide power to load during normal operation.
   4. Static switch to transfer load automatically and without disturbance between inverter and utility power.
   5. Manual switch to bypass static switch for maintenance.
   6. Input and output isolation transformers and filters to provide appropriate isolation and disturbance attenuation.
   7. Monitors, sensors, and control circuits.

C. Design Standards: IEEE 519 and NEMA PE 1.

D. Seismic Qualification: Provide uninterruptible power supply systems and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.

2.03 SYSTEM RATINGS AND OPERATING CHARACTERISTICS

A. System Continuous Rating: As indicated on drawings, over entire battery voltage range at specified power factor. Maintain output voltage within specified limits at any load from full load to no-load.

B. Battery Capacity: 15 minutes.

C. Voltage Rating: 120/208 volts, 3 phase.

D. Input Voltage Operating Range: Plus or minus 10 percent.

E. Input Frequency Operating Range: 60 Hz. Plus or minus 3 Hz.

F. Input Current Limit: Adjustable to maximum of 125 percent of that required to operate at full load with battery bank on float charge.

G. Current Walk-in: 25 to 100 percent in fifteen seconds.

H. UPS Power Factor Over Full Range of Loads and Input Voltages: 74 to 100 percent, lagging.

I. Harmonic Distortion of Input Current Wave Form: 5 percent maximum at full load.

J. Output Free Running Frequency: 60 Hz Plus or minus 0.5 percent.

K. Output Harmonic Distortion: Maximum 5 percent rms total harmonic distortion (THD) and maximum 3 percent any single harmonic, at rated frequency and voltage, from 10 percent load to full load and over battery voltage range, measured into a linear load.

L. Voltage Transient Response for Application of 0 to 50 Percent, 50 to 100 Percent, 100 to 50 Percent, and 50 to 0 Percent Step Loads, and Transfer To and From Bypass Line:

M. Three-phase Overload Ratings:
   1. 1000 percent for 5 cycles; via static switch.

N. Output Current Limit: 150 percent of rated output current.

O. Voltage Unbalance: 3 percent maximum line-line with 100 percent load unbalance.

2.04 DESIGN

A. Inverter Type: Pulse-width modulated.

B. Rectifier/Charger Capacity: Sufficient to supply full load to inverter while recharging fully-discharged battery to 95 percent of full capacity in four hours or less; and within the input current limits specified.

C. Provide means for on-line testing of UPS, including test points to allow adjusting and servicing. Provide means for testing static switch while load is bypassed to utility.

D. Mean Time Between Failures: 60,000 hours, minimum.

E. Cooling: Natural or forced convection.

F. Operate battery floating, isolated from the UPS AC input and AC output. The battery may be resistance grounded through 5,000 to 10,000 ohms for the purpose of ground fault sensing.

G. Do not use continuous moving parts or electron tubes. Accomplish power switching using semiconductor devices.

H. Construct equipment so each power component can be replaced without a soldering iron or special tools.

I. Use front-panel removable plug-in control modules.

2.05 FABRICATION

A. Electroplate brackets and securing hardware with corrosion resistant material. Secure bolts, studs and nuts with lock washers.

B. Identify internal wiring at each end of conductor. Provide cabinet grounding lug.

C. Conversion Equipment Enclosure: NEMA 250, Type 1 enclosure allowing access from front for servicing adjustments and connections. Access through hinged door equipped with tumbler lock and latch handle. Equip cabinet for fork truck lifting.

D. Equip air inlet with permanent type filters and pressurize cabinet, or use gaskets around door and panel openings to prevent entry of dirt.

E. Cabinet finish: Primed and painted inside and outside with suitable semi-gloss enamel.

2.06 BATTERY

A. Storage Battery: Lead calcium heavy duty industrial battery, designed for auxiliary power service. Provide battery with impact resistant plastic case. Provide cells with explosion proof vents, clear containers, and ample space for plate growth without stressing container and cover.

B. Electrolyte Specific Gravity: No greater than 1.250 when full charged and measured at 77 degrees F (25 degrees C).

C. Ampere-Hour Rating: Sufficient to supply direct current to inverter for outage period specified, with inverter operating at full rated output, to a discharge limit of not less than 1.65 volts per cell.

D. Battery Racks: Maximum of three-tier, all steel construction, with plastic insulating rails at all points of contact with the battery case. Paint racks with acid resistant paint.

2.07 CONTROLS AND INDICATORS

A. Controls:
1. AC input circuit breaker.
2. Inverter operate switch to initiate inverter operation.
3. Inverter standby switch to cause inverter to cease operation
4. Static switch transfer switch to permit manual actuation of static transfer switch.
5. Static switch lock-out switch to inhibit automatic retransfer of load to inverter.
6. Battery charge timer.
7. Indicator test switch.
8. Static switch preferred input circuit breaker
9. Static switch output circuit breaker.
10. Static switch bypass circuit breaker.
11. Controls for maintenance bypass switch.

B. Indicators:
1. Static transfer switch inhibited.
2. High/low DC voltage.
3. Overtemperature.
4. Inverter output overload.

C. Meters: Use 1 percent accuracy meters to indicate the following:
1. Rectifier/charger DC voltage and current.
2. Utility, inverter output, and load AC voltage.
3. Load AC current.
4. UPS output watts.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide required support and attachment in accordance with Section 260529.

C. Provide required seismic controls in accordance with Section 260548.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Verify specification performance criteria.

C. Measure battery discharge and recharge times.

D. Simulate fault in each system component and utility power.

3.03 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstrate operation uninterruptible power supply by simulating an outage.

END OF SECTION

SECTION 263600 - TRANSFER SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
   1. Automatic transfer switches.
   2. Manual transfer switches.
   3. Includes bypass/isolation transfer switches.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for the seismic qualification of equipment specified in this section.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 260573 - Power System Studies: Additional criteria for the selection of equipment specified in this section.

G. Section 263213 - Engine Generators: For interface with transfer switches.
   1. Includes code requirements applicable to work of this section.
   2. Includes additional testing requirements.
   3. Includes related demonstration and training requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.

G. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
      a. Engine Generators: See Section 263213.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
   1. Clearly indicate whether proposed short circuit current ratings are based on testing with specific overcurrent protective devices or time durations; indicate short-time ratings where applicable.
   2. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Specimen Warranty: Submit sample of manufacturer's warranty.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

G. Manufacturer's certification that products meet or exceed specified requirements.

H. Source quality control test reports.

I. Manufacturer’s detailed field testing procedures.

J. Field quality control test reports.

K. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

L. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

M. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

N. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Bypass/Isolation Transfer Switches: Provide accessories (ramps, dollies, etc.) necessary for removal of drawout components.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 263213.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   1. Authorized service facilities located within 200 miles (320 km) of project site.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Transfer Switches:
   1. ABB: www.electrification.us.abb.com/#sle.
   2. Eaton Corporation: www.eaton.com/#sle.
   3. Generac Power Systems: www.generac.com/industrial/#sle.
   4. Schneider Electric; ASCO Power Technologies: www.ascopower.com/#sle.
   5. Thomson Power Systems: www.thomsonps.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:
   1. Utilize open transition transfer unless otherwise indicated or required.
   2. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):
      a. Unless otherwise indicated or required, provide neutral switching:
         1) Where the alternate/emergency source is a separately derived system.

D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

E. Automatic Transfer Switch:
   1. Transfer Switch Type: Bypass/isolation automatic transfer switch.
   2. Voltage: 120V/208Y 3ph.
   3. Ampere Rating: 400A.
   4. Load Served: As indicated on the drawings.
   5. Primary Source: Existing normal power switchboard.
   6. Alternate Source: Engine generator.
   7. Products:
      a. Schneider Electric; ASCO 7000 Series Automatic Transfer Switches: www.ascopower.com/#sle.

F. Basis of Design - Automatic Transfer Switch: Schneider Electric; ASCO 7000 Series: www.ascopower.com/#sle.
   1. Non-Service-Entrance Switch:
      a. Frame: 150 A to 600 A.
      b. Transition Configuration: Open transition.
      c. Neutral Configuration: Switched neutral.
      d. Phase Poles: Three.
      e. Ampere Rating: 400 A.
      f. Voltage: 208 V.
      g. Enclosure: Type 1.

G. Manual Transfer Switch:
   1. Voltage: As indicated on the drawings.
   2. Ampere Rating: As indicated on the drawings.
   3. Neutral Configuration: Switched neutral.
   4. Load Served: As indicated on the drawings.
   5. Primary Source: As indicated on the drawings.
   6. Alternate Source: As indicated on the drawings.

H. Basis of Design - Manual Transfer Switch: Schneider Electric; ASCO 300 Series: www.ascopower.com/#sle.
   1. Frame: 150 A to 600 A.
   2. Configuration: Manual transfer switch.
   3. Neutral Configuration: Switched neutral.
   4. Phase Poles: Three.
   5. Ampere Rating: 400 A.
   6. Voltage: 208 V.
   7. Enclosure: Type 3R secure.
   8. Provide the following:
      a. Strip heater with thermostat; wired to load terminals.
      b. Surge suppressor, 65 kA.
      c. LED indication and Form C contacts for source 1 available, source 2 available, connected to source 1, connected to source 2, disconnected position, and external 24 VDC connection.
         1) Maintained engine start switch/output with common alarm input/LED/contact.
         2) Phase rotation monitor.
         3) I/O module.

I. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

J. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

K. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

L. Switching Methods:
   1. Open Transition:
      a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
   2. Delayed Transition:
      a. Provide break-before-make transfer with programmable time delay in a neutral position not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
   3. Neutral Switching: Either simultaneously switched neutral (break-before-make) or overlapping neutral (make-before-break) methods are acceptable.
   4. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

M. Seismic Qualification: Provide transfer switches and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.

N. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.
   1. Altitude: 3500 feet (_____ m).

O. Enclosures:
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
   2. Finish: Manufacturer's standard unless otherwise indicated.

P. Short Circuit Current Rating:
   1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Short Time Rating: Where the requirement for selectivity is indicated, provide transfer switches with short time ratings suitable for the maximum short time delay setting of the supply side overcurrent protective device.

Q. Automatic Transfer Switches:
   1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
   2. Control Functions:
      a. Automatic mode.
      b. Test Mode: Simulates failure of primary/normal source.
      c. Voltage and Frequency Sensing:
         1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
         2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
         3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
      d. Outputs:
         1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
         2) Auxiliary contacts; one set(s) for each switch position.
      e. Adjustable Time Delays:
         1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
         2) Transfer to alternate/emergency source time delay.
         3) Retransfer to primary/normal source time delay.
         4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
      f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
      g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
   3. Status Indications:
      a. Connected to alternate/emergency source.
      b. Connected to primary/normal source.
      c. Alternate/emergency source available.
   4. Automatic Sequence of Operations:
      a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
      b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.

c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

R. Manual Transfer Switches:
1. Description: Transfer switches with manually initiated transfer between sources; mechanically operated and mechanically held.

S. Bypass/Isolation Transfer Switches:
1. Description: Factory-assembled units consisting of interconnected transfer switch and bypass/isolation switch that permits manual bypass and isolation of the transfer switch with connection of the load to either source.
2. Bypass/Isolation Switch Type: Provide overlapping (make-before-break) switches with no interruption of power to load. Load break (break-before-make) switches that interrupt power to load are not acceptable.
3. Bypass/Isolation Operation:
a. Operable from exterior of enclosure.
b. Normal Mode: Provides for normal operation of transfer switch.
c. Test Mode: Provides for operational testing of bypassed transfer switch without affecting power to load.
d. Isolate Mode: Provides for complete isolation of transfer switch from all power sources, permitting removal from unit.

T. Interface with Other Work:
1. Interface with engine generators as specified in Section 263213.

2.03 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 260529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

G. Provide grounding and bonding in accordance with Section 260526.

H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Automatic Transfer Switches:
   1. Inspect and test in accordance with NETA ATS, except Section 4.
   2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.
      a. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Provide additional inspection and testing as required for completion of associated engine generator testing as specified in Section 263213.

E. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Instructor: Manufacturer's authorized representative.
   3. Location: At project site.

E. Coordinate with related generator demonstration and training as specified in Section 263213.

3.06 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

END OF SECTION

SECTION 264300 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

C. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 262416 - Panelboards.

C. Section 271000 - Structured Cabling: Protectors for communications service entrance.

1.03 ABBREVIATIONS AND ACRONYMS

A. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.06 SUBMITTALS

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

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

C. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

E. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

F. Project Record Documents: Record actual connections and locations of surge protective devices.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

C. Exclude surge protective devices from any clause limiting warranty responsibility for acts of nature, including lightning, stated elsewhere.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

B. Source Limitations: Provide surge protective devices produced by single manufacturer and obtained from single supplier.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):
   1. Equivalent to basis of design.
   2. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type 1.

H. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
   1. Panelboards: See Section 262416.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

2.04 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Distribution locations include SPDs connected to distribution panelboards.

B. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); Advantage Series; Model SSLA (100 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.
   1. Voltage: 3Y1 - 3 Phase Wye (L1, L2, L3, N, G) rated 120/208 V.
   2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.

2.05 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); Advantage Series; Model SSLA (100 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.
   1. Voltage: 3Y1 - 3 Phase Wye (L1, L2, L3, N, G) rated 120/208 V.
   2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

3.03 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 265100 - INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Exit signs.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260918 - Remote Control Switching Devices: Remote controls for lighting, including network lighting controls, programmable relay panels, and remote control switching relays.

F. Section 260923 - Lighting Control Devices.
   1. Includes automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.

G. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

H. Section 265600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

A. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

B. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

F. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

2.04 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.

H. Suspended Luminaires:
   1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 265600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260923 - Lighting Control Devices.
   1. Includes automatic controls for lighting including outdoor motion sensors, time switches, and outdoor photo controls.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 5-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 270529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 270533.13 - Conduit for Communications Systems: Additional support and attachment requirements for conduits.

D. Section 271000 - Structured Cabling.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.

E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

F. MFMA-4 - Metal Framing Standards Publication; 2004.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. TIA-569.
      b. NFPA 70.
      c. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Noncontinuous Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.
   1. Applications:
      a. Do not exceed 5 feet (1.5 m) between cable supports.
      b. Maximum Number of Cables per Cable Support:
         1) J-Hooks: 40 percent of fill capacity.
      c. Allowable Cable Types:
         1) J-Hooks: Category 3, Category 5e, and Category 6.
         2) Bridle Rings with Saddle: Category 3, Category 5e, and Category 6.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch (6 mm) diameter.
      b. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch (10 mm) diameter.
      c. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.
      d. Outlet Boxes: 1/4-inch (6 mm) diameter.

G. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners in accordance with manufacturer's recommended torque settings.

I. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 270533.13 - CONDUIT FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel electrical metallic tubing (EMT).

B. Aluminum electrical metallic tubing (EMT).

C. Rigid polyvinyl chloride (PVC) conduit.

D. Electrical nonmetallic tubing (ENT).

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 270529 - Hangers and Supports for Communications Systems.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.

D. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

E. BICSI TDMM - Telecommunications Distribution Methods Manual, 14th Edition; 2020.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

G. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

L. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. TIA-568.0 - Generic Telecommunications Cabling for Customer Premises; 2020e.

O. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

P. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

Q. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

R. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

S. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

T. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.

U. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.

V. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of cables to be installed.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of communications cables until installation of conduit between termination points is complete.

1.05 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where conduit type for particular application is not specified, EMT.

C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.

D. Embedded Within Concrete:
   1. Within Slab on Grade: Use rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70 and TIA-569.

B. Provide conduit, fittings, supports, and accessories required for complete communications pathway.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Communications Outlet Box: 3/4-inch (21 mm) trade size.
   2. Continuous Conduit Homerun Serving One Communications Outlet Box: 1-inch (27 mm) trade size.
   3. Continuous Conduit Homerun Serving Two Communications Outlet Boxes: 1-inch (27 mm) trade size.
   4. Continuous Conduit Homerun Serving Three Communications Outlet Boxes: 1-1/4-inch (35 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

2.03 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.04 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
   2. Material: Use aluminum.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.05 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
   3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.06 ELECTRICAL NONMETALLIC TUBING (ENT)

A. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA TC 13 and listed and labeled as complying with UL 1653.

B. Fittings:
   1. Manufacturer: Same as manufacturer of ENT to be connected.
   2. Use solvent-welded type fittings.
   3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

2.07 ACCESSORIES

A. Inside-Plant Fabric Innerduct:
   1. Listed as complying with UL 2024; plenum rated.

B. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).

C. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

D. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Galvanized Steel Electrical Metallic Tubing (EMT): Install in accordance with NECA 101.

D. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

E. Electrical Nonmetallic Tubing (ENT): Install in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. Conceal conduits unless specifically indicated to be exposed.
   3. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Communications rooms.
      c. Within joists in areas with no ceiling.
   4. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   5. Arrange conduit to maintain adequate headroom, clearances, and access.
   6. Route conduits above water and drain piping where possible.
   7. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   5. Use metal channel/strut with accessory conduit clamps to support multiple, parallel, surface-mounted conduits.
   6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple, parallel, suspended conduits.
   8. Use of wire for support of conduits is not permitted.
      a. For securing conduits to studs in hollow stud walls.

b. For suspending conduits supported by spring steel conduit clips, where specifically indicated or permitted.

9. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

H. Connections and Terminations:
1. Use suitable adapters where required to transition from one type of conduit to another.
2. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
3. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
4. Conceal bends for conduit risers emerging above ground.
5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

J. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
a. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.

K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Maximum Conduit Size: 1-inch (27 mm) trade size unless otherwise approved.
2. Install conduits within middle one third of slab thickness.
3. Secure conduits to prevent floating or movement during pouring of concrete.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Project has expansion joint along existing exterior wall and new construction.

M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
a. Where conduits enter building from outside.
b. Where service conduits enter building from underground distribution system.
c. Where conduits enter building from underground.
d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
a. Where conduits pass from outdoors into conditioned interior spaces.
b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in each empty conduit and innerduct/cell, and in each conduit where cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

O. Provide grounding and bonding.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of cables.

END OF SECTION

SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal cable tray systems:
   1. Metal wire mesh/basket cable tray.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 270529 - Hangers and Supports for Communications Systems.

1.03 REFERENCE STANDARDS

A. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

B. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.

C. NEMA BI-50016 - Cable Tray Installation Guidelines; 2024.

D. NEMA VE 1 - Metal Cable Tray Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate arrangement of cable tray with structural members, ductwork, piping, equipment and other potential conflicts. Coordinate work to avoid installation of obstructions within cable tray required clearances.
   2. Coordinate arrangement of cable tray with dimensions and clearance requirements of actual products to be installed.
   3. Coordinate work with placement of supports and anchors required for mounting.
   4. Notify of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week prior to commencing work of this section; require attendance of affected installers. Review proposed routing, sequence of installation, and protection requirements for installed cable tray.

C. Sequencing:
   1. Do not begin installation of cables until installation of associated cable tray run is complete.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable tray system components and accessories. Include dimensions, materials, fabrication details, finishes, and span/load ratings.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Project Record Documents: Record actual routing of cable tray and locations of supports.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Product Evaluation and Listing Organization Qualifications: Organization engaged in evaluation of products and services, including those recognized by OSHA as Nationally Recognized Testing Laboratories (NRTL), and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NEMA BI-50016, except do not store cable tray outdoors without cover as permitted in NEMA BI-50016.

B. Handle products carefully to avoid damage to finish.

PART 2 PRODUCTS

2.01 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

A. Provide new cable tray system consisting of required components, fittings, supports, and accessories, as necessary for complete system.

B. Provide products listed, classified, and labeled as suitable for purpose intended.

C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.

D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under service conditions at installed location.

E. Unless otherwise indicated, specified span/load ratings are based on safety factor of 1.5 and working load only (i.e., no additional concentrated static load), with ratings for metal cable tray systems in accordance with NEMA VE 1.

F. Unless otherwise indicated, specified load/fill depths and inside widths are nominal values, with values for metal cable tray systems in accordance with NEMA VE 1 including applicable allowable tolerances.

2.02 METAL CABLE TRAY SYSTEMS

A. Comply with NEMA VE 1.

B. Material/Finishes:
   1. Zinc Electroplated Steel: Comply with ASTM B633.

C. Metal Wire Mesh/Basket Cable Tray:
   1. Material: Zinc-electroplated steel or mill-galvanized before fabrication (pre-galvanized) steel.
   2. Tray Depth: As indicated on drawings.
   3. Span/Load Rating: As indicated on drawings.
   4. Mesh Spacing: 2 by 4 inches (51 by 102 mm).
   5. Tray Width: As indicated on drawings.

2.03 ACCESSORIES

A. Inside-Plant Fabric Innerduct:
   1. Listed as complying with UL 2024; plenum rated.

2.04 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Metal Cable Tray: Perform factory design tests in accordance with NEMA VE 1, including electrical continuity and load testing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage cable tray system has been completed.

B. Verify field measurements.

C. Verify dimensions and span/load ratings of cable tray system components.

D. Verify that mounting surfaces are ready to receive cable tray and associated supports.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Unless otherwise indicated, arrange cable tray to be parallel or perpendicular to building lines.

C. Arrange cable tray to provide required clearances and maintain cable access.
   1. Maintain minimum clearance of 3 inches (75 mm) between bottom of cable tray and top of suspended ceilings, unless otherwise indicated or required by authorities having jurisdiction.

D. Install cable tray plumb and level, with sections aligned and with horizontal runs at specified elevation.

E. Metal Wire Mesh/Basket Cable Tray: Field fabricate fittings in accordance with manufacturer's instructions, using only manufacturer-approved connectors classified for bonding.
   1. Inside Radius of Fittings: 12 inches (305 mm).

F. Cable Tray Movement Provisions:
   1. Provide expansion fittings where cable tray is subject to movement, including but not limited to:
      a. Where cable tray crosses structural joints intended for expansion.
      b. Long straight cable tray runs in accordance with NEMA BI-50016.
   2. Use expansion guides in lieu of hold-down clamps where prescribed in NEMA BI-50016.
   3. Set gaps for expansion fittings in accordance with NEMA BI-50016.

G. Cable Provisions:
   1. Use fixed barrier strips to maintain separation of cables as indicated and as required by NFPA 70.
   2. Use drop-out fittings or bushings where cables exit cable tray as required to maintain minimum cable bending radius.
   3. Use cable support fittings for long vertical cable tray runs with heavy cables.

H. Provide end closures at unconnected ends of cable tray runs.

I. Cable Tray Support:
   1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA BI-50016, BICSI ITSIMM, and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment where not furnished by cable tray manufacturer.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

J. Grounding and Bonding Requirements:
   1. Install cable tray grounding in accordance with the following. Where requirements differ, comply with the most stringent.
   2. Metal Cable Tray Systems: Use suitable bonding jumpers or classified cable tray connectors to provide electrical continuity. Do not use classified cable tray connectors where cable tray sections have been modified, such as being bent, cut, or reshaped.
   3. Provide suitable bonding conductor in each metal cable tray. Do not use cable tray as sole bonding conductor.

K. Conduit Termination:
   1. Use listed cable tray conduit clamps (evaluated for bonding connection) to terminate conduits at cable tray.
   2. Provide insulating bushing at conduit termination to protect cables.
   3. Provide independent support for conduit.

L. Cable Installation:

1. Install cables in accordance with the following. Where requirements differ, comply with most stringent.
2. Use appropriate cable pulling tools, applied to prevent excessive force on cable tray system and maintain minimum cable bending radius.
3. Use cable clamps or cable ties to fasten conductors/cables to vertical and horizontal runs of cable tray.
    a. Distance Between Fastening Points for Vertical Runs: 18 inches (450 mm).
    b. Distance Between Fastening Points for Horizontal Runs: As required to maintain spacing and confine conductor/cable within cable fill area.

M. Penetrations: Install firestopping to preserve fire resistance rating of building elements.
1. See Section 078400 for additional requirements.

N. Identification Requirements:
1. Use warning labels to identify cable tray with word message "WARNING! Do Not Use As A Walkway, Ladder, Or Support For Personnel. Use Only As A Mechanical Support For Cables, Tubing and Raceways." at maximum intervals of 20 ft (6 m).

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect cable tray system for damage and defects.

C. Correct deficiencies and replace damaged or defective cable tray system components.

3.04 ADJUSTING

A. Adjust tightness of mechanical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Remove dirt and debris from cable tray.

B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 PROTECTION

A. Protect cable tray system from subsequent construction operations.

END OF SECTION

SECTION 271000 - STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems.
   1. Includes bonding jumpers for bonding of communications systems and electrical system grounding.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products.

E. Section 262726 - Wiring Devices.

F. Section 270529 - Hangers and Supports for Communications Systems.

G. Section 270533.13 - Conduit for Communications Systems.

1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.

D. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).

G. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

H. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement; 2015a (Reaffirmed 2022).

I. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; IEC 61280-4.1 Edition 3.1, Fiber Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant- Multimode Attenuation Measurement; 2023d.

J. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2023.

K. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

L. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.

M. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

N. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).

O. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

P. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).

Q. UL 444 - Communications Cables; Current Edition, Including All Revisions.

R. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

S. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

T. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

U. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

D. Field Test Reports.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
   2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
   4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
   1. Locate intermediate distribution frames as indicated on the drawings.

C. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

A. Conduit: See section 270533.13.

B. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

2.03 COPPER CABLE AND TERMINATIONS

A. Copper Backbone Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
   2. Cable Type: TIA-568.2 Category 3 UTP (unshielded twisted pair); 24 AWG.
   3. Cable Capacity: Quantity of pairs as indicated on drawings.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

B. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   3. Cable Capacity: 4-pair.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
      c. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.
   5. Cable Jacket Color - Voice and Data Cable: Blue.

C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
   1. Performance: 500 mating cycles.
   2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

E. Copper Patch Cords:
   1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
   2. Patch Cords for Patch Panels:
      a. Quantity: One for each pair of patch panel ports.
      b. Length: 6 feet (_____ mm).

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Fiber Optic Backbone Cable:
   1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
   2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
   3. Cable Capacity: Quantity of fibers as indicated on drawings.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
   5. Cable Jacket Color:
      a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
      b. Multimode Fiber (OM1/OM2): Orange.
      c. Single-Mode Fiber (OS1/OS2): Yellow.

B. Fiber Optic Horizontal Cable:
   1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
   2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
   3. Cable Capacity: 2-fiber.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
      c. General Applications: Use listed NFPA 70 Type OFN/OFNG general purpose cable, Type OFNR riser cable, or Type OFNP plenum cable.
   5. Cable Jacket Color:
      a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
      b. Multimode Fiber (OM1/OM2): Orange.
      c. Single-Mode Fiber (OS1/OS2): Yellow.

C. Fiber Optic Interconnecting Devices:
   1. Connector Type: Type LC.
   2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
   3. Maximum Attenuation/Insertion Loss: 0.3 dB.

D. Fiber Optic Patch Cords:
   1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.
   2. Patch Cords for Patch Panels:

a. Quantity: One for each pair of patch panel ports.
b. Length: 6 feet (_____ mm).

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
1. Manufacturers:
2. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
3. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:
1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
c. Provide incoming cable strain relief and routing guides on back of panel.
d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
e. Provide dust covers for unused adapters.

C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
1. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:
1. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
2. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
3. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
4. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.
5. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
6. Cabinets: Steel construction with corrosion resistant finish.
7. Locks: Keyed alike.

2.06 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 260533.16.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
a. Voice Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.

b. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

B. Wall Plates:
1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
a. Voice Only Outlets: 2 ports.
b. Data or Combination Voice/Data Outlets: 4 ports.
4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 262726.

2.07 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

B. Comply with Section 260526.

2.08 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

B. Comply with Section 260553.

2.09 ACCESSORIES

A. Inside-Plant Fabric Innerduct:
1. Self-Supporting Inside-Plant Fabric Innerduct: See Section 270529.
2. Listed as complying with UL 2024; plenum rated.

2.10 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

C. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches (300 mm) from power conduits and cables and panelboards.
3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:
1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.
a. Mounting Heights: Unless otherwise indicated, as follows:
1) Telephone and Data Outlets: 18 inches (450 mm) above finished floor.
b. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
c. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.

d. Locate outlet boxes so that wall plate does not span different building finishes.
e. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches (3000 mm).
2. At Outlets - Copper: 12 inches (305 mm).
3. At Outlets - Optical Fiber: 39 inches (1000 mm).

C. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
3. Use T568B wiring configuration.

D. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

E. Wall-Mounted Racks and Enclosures:
1. Install to plywood backboards only, unless otherwise indicated.
2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

G. Identification:
1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
1. Test backbone cables after termination but before cross-connection.
2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
3. Test operation of shorting bars in connection blocks.

4. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.

E. Testing - Fiber Optic Cabling:
   1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
   2. Multimode Backbone: Perform tests in accordance with TIA-526-14.
   3. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
   4. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 281000 - ACCESS CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access control system requirements.

B. Access control units and software.

C. Access control point peripherals, including readers and keypads.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 087100 - Door Hardware: Electrically operated door hardware, for interface with access control system.
   1. Includes door hardware with integral request to exit devices.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260533.13 - Conduit for Electrical Systems.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 271000 - Structured Cabling: Data cables for access control system IP network connections.

G. Section 282000 - Video Surveillance: For interface with access control system.

1.03 DEFINITIONS

A. Access Control Cloud Services: Subscription-based hosted application utilizing Software as a Service (SaaS) delivery model in lieu of on-premises servers/software.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other installers to provide suitable door hardware as required for both access control functionality and code compliance.
   2. Coordinate the placement of readers with millwork, furniture, equipment, etc. installed under other sections or by others.
   3. Coordinate the work with other installers to provide power for equipment at required locations.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Access Control Cloud Services:
   1. Subscription fees to be paid by Owner.
   2. Obtain Owner approval of subscription fees and terms of service prior to submittal.

1.06 SUBMITTALS

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

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

D. Certify that proposed system design and components meet or exceed specified requirements.

E. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

F. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1.07 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70.
   2. The requirements of the local authorities having jurisdiction.
   3. Applicable TIA/EIA standards.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Where possible, furnish system components and accessories produced by single manufacturer and obtained from single supplier.

2.02 ACCESS CONTROL SYSTEM REQUIREMENTS

A. Design and provide new access control system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with access control system.
   2. Interface with electrically operated door hardware as specified in Section 087100.
      a. Capable of locking/unlocking/releasing controlled doors.
      b. Capable of receiving input from integral door hardware switches.
   3. Interface with video surveillance system as specified in Section 282000.
      a. Capable of affecting camera/video operation for selected access control system events.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.
   1. Access Control Units and Readers: Listed and labeled as complying with UL 294.

2.03 ACCESS CONTROL UNITS AND SOFTWARE

A. Provide access control units and software compatible with readers to be connected.

B. Unless otherwise indicated, provide software and licenses required for fully operational system.

2.04 ACCESS CONTROL POINT PERIPHERALS

A. Provide devices compatible with control units and software.

B. Provide devices suitable for operation under the service conditions at the installed location.

C. Readers and Keypads:
   1. General Requirements:
      a. Provide readers compatible with credentials to be used.
      b. Color: To be selected by Architect from manufacturer's available standard colors.
      c. Contactless Smart Card Readers:
         1) Utilize 13.56 MHz RF communication with compatible credentials.
         2) Utilize 64 bit authentication keys.
         3) Support ISO compliant credentials.
         4) Support data encryption.
      d. Proximity Readers:
         1) Utilize 125 kHz RF communication with compatible credentials.

D. Door Position Switches:
   1. Magnetic Contacts: Encapsulated reed switch(es) and separate magnet; designed to monitor opened/closed position of doors.
   2. Contact Color: To be selected by Architect from manufacturer's available standard colors.

E. Request to Exit Devices:
   1. Door Hardware with Integral Request to Exit Switches: Comply with Section 087100.

F. Door Locking Devices (Electric Strikes and Magnetic Locks): Comply with Section 087100.

G. Alarm Sounders:
   1. Minimum Sound Output: 85 db.

2.05 ACCESSORIES

A. Provide components as indicated or as required for connection of access control system to devices and other systems indicated.

B. Unless otherwise indicated, credentials to be provided by Contractor.
   1. Provide credentials compatible with readers and control units/software to be used.

C. Unless otherwise indicated, network switches required for network connections to system components to be provided by Contractor.

D. Provide cables as indicated or as required for connections between system components.
   1. Data Cables for IP Network Connections: Unshielded twisted pair (UTP), minimum Category 5e, complying with Section 271000.

E. Provide end-of-line resistors (EOLR) as required for supervision of hardwired connections.

F. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Wiring Method: Unless otherwise indicated, use wiring in conduit.
   1. Use suitable listed cables in wet locations, including underground raceways.
   2. Use suitable listed cables for vertical riser applications.
   3. Install wiring in conduit for the following:
      a. Where required for rough-in.
      b. Where required by authorities having jurisdiction.
      c. Where exposed to damage.
      d. Where installed outside the building.
      e. For exposed connections from outlet boxes to devices.
   4. Conduit: Comply with Section 260533.13.
   5. Use power transfer hinges complying with Section 087100 for concealed connections to door hardware.
   6. Do not exceed manufacturer's recommended maximum cable length between components.

D. Provide grounding and bonding in accordance with Section 260526.

E. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

F. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Program system parameters according to requirements of Owner.

D. Test for proper interface with other systems.

E. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Location: At project site.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION

SECTION 282000 - VIDEO SURVEILLANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Video surveillance system requirements.

B. Video recording and viewing equipment.

C. Cameras.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260533.13 - Conduit for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 271000 - Structured Cabling: Data cables for IP video surveillance system network connections.

F. Section 281000 - Access Control: For interface with video surveillance system.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 303 - Standard for Installing and Maintaining Closed-Circuit Television (CCTV) Systems; 2019.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

D. Certify that proposed system design and components meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

F. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

G. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70.
   2. Applicable TIA/EIA standards.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Where possible, furnish system components and accessories produced by single manufacturer and obtained from single supplier.

2.02 VIDEO SURVEILLANCE SYSTEM

A. Design and provide new video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description: IP system with connection to network (IP) cameras.

C. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with video surveillance system.
   2. Interface with access control system as specified in Section 281000.
      a. Capable of affecting camera/video operation for selected access control system events.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.03 VIDEO RECORDING AND VIEWING EQUIPMENT

A. Provide video recording and viewing equipment compatible with cameras to be connected.

B. Software:

1. Unless otherwise indicated, provide all software and licenses required for fully operational system.

2.04 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Network (IP) Cameras:
   1. Signal-to-Noise Ratio: Not less than 50 dB.
   2. Provide the following standard features:
      a. Automatic electronic shutter.
      b. Automatic gain control.
      c. Automatic white balance.
      d. Web-based interface for remote viewing and setup.
      e. Password protected security access.

2.05 ACCESSORIES

A. Camera Enclosures: Where not factory-installed, provide camera enclosures suitable for operation under service conditions at installed location.

B. Camera Mounting Supports: Where not factory installed, provide mounting supports necessary for installation.

C. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.

D. Provide components as indicated or as required for system power and network connections.

E. Provide cables as indicated or as required for connections between system components.

F. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system where applicable.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 260529.

D. Wiring Method: Unless otherwise indicated, use wiring in conduit.
   1. Use suitable listed cables in wet locations, including underground raceways.
   2. Use suitable listed cables for vertical riser applications.
   3. Conduit: Comply with Section 260533.13.
   4. Conceal all cables unless specifically indicated to be exposed.

E. Provide grounding and bonding in accordance with Section 260526.

F. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.

D. Program system parameters according to requirements of Owner.

E. Test for proper interface with other systems.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Location: At project site.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION

SECTION 284600 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping: Materials and methods for work to be performed by this installer.

B. Designed using manufacturer's product-specific design software or based on manufacturer's pre-engineered design suitable for the application.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems: Requirements for the seismic qualification of equipment specified in this section.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

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

B. Drawings must be prepared as reproducible drawings.
   1. Owner will provide floor plan drawings for Contractor's use; verify all dimensions on Owner-provided drawings.

C. Evidence of designer qualifications.

D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
12. Certification by Contractor that the system design complies with Contract Documents.
13. Do not show existing components to be removed.

E. Manufacturer's equipment seismic qualification certification.

F. Evidence of installer qualifications.

G. Evidence of instructor qualifications; training lesson plan outline.

H. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

I. Operating and Maintenance Data: See Section 017800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

J. Project Record Documents: See Section 017800 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

K. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
3. Certificate of Occupancy.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
   1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
   2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
   3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units and Accessories:
   1. Provide control units made by the same manufacturer.

B. Initiating Devices and Notification Appliances:
   1. Same manufacturer as control units.
   2. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
   2. Protected Premises: area of new construction. Tie into existing FA system.
   3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. ADA Standards.
      b. The requirements of the local authority having jurisdiction , which is Baker County.
      c. Applicable local codes.
      d. Contract Documents (drawings and specifications).
      e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
   4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
   5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
   6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
   7. Program notification zones and voice messages as directed by Owner.

B. Supervising Stations and Fire Department Connections:
   1. Public Fire Department Notification: By on-premises supervising station.
   2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at Main Electrical Room.
   3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.
   4. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.

C. Circuits:
   1. Initiating Device Circuits (IDC): Class B, Style A.
   2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
   3. Signaling Line Circuits (SLC) Between Buildings: Class A, Style 2.
   4. Notification Appliance Circuits (NAC): Class B, Style W.

D. Power Sources:
   1. Primary: Dedicated branch circuits of the facility power distribution system.
   2. Secondary: Storage batteries.
   3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
   4. Each Computer System: Provide uninterruptible power supply (UPS).

E. Seismic Qualification: Provide fire alarm system and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.

2.03 EXISTING COMPONENTS

A. Existing Fire Alarm System: Do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.

B. On-Premises Supervising Station: Include as part of this work all modifications necessary to existing supervising station to accommodate new fire alarm work.

C. Clearly label components that are "Not In Service."

D. Remove unused existing components and materials from site and dispose of properly.

2.04 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:

2.05 COMPONENTS

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: _____.

D. Initiating Devices:
   1. Addressable Systems:
      a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
      b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

E. Notification Appliances:

F. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

H. Locks and Keys: Deliver keys to Owner.

I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.

B. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:

C. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

B. Occupancy of the project will not occur prior to Substantial Completion.

C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
   1. Approved operating and maintenance data has been delivered.
   2. All aspects of operation have been demonstrated to Owner.
   3. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
   4. Occupancy permit has been granted.

END OF SECTION

SECTION 32 33 00 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bicycle racks.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for [installing pipe sleeves cast][installing anchor bolts cast][formed voids] in concrete footings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Initial Selection: For units with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.

1. Include full-size Samples of bicycle rack. Approved samples may be incorporated into the Work.

F. Product Schedule: For site furnishings.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For site furnishings manufactured with preservative-treated wood.

1. Indicate type of preservative used and net amount of preservative retained.[For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.]

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Bench Replacement [Slats][Planks]: No fewer than [two]<Insert number> full-size units for each size indicated.
2. Trash Receptacle Inner Containers: [Five]<Insert number> full-size units for each size indicated, but no fewer than [two]<Insert number> units.
3. Anchors: <Insert type and number>.

PART 2 - PRODUCTS

2.1 BICYCLE RACKS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Ground Control Systems

B. Bicycle Rack Construction:

1. Frame: Steel.

a. [Tubing] OD: 1.9” HSS

2. Style: [Double-sided parking

a. Overall Height: 32-3/8”
b. Overall Width: 24-1/2”
c. Overall Depth: 1.90”
d. Capacity: Designed to accommodate no fewer than two bicycles.

3. Security: Designed to lock frame.
4. Accessories: Base covers for each pipe and tubing anchored end.
5. Installation Method: Surface flange anchored at finished grade to substrate indicated

C. Steel Finish: Color coated.

1. Color: Black Polyester Powder Coat

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B211.
2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B221.
3. Structural Pipe and Tube: ASTM B429/B429M.
4. Sheet and Plate: ASTM B209.
5. Castings: ASTM B26/B26M.

B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A36/A36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A53/A53M, or electric-resistance-welded pipe complying with ASTM A135/A135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A500/A500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A513/A513M, or steel tubing fabricated from steel complying with ASTM A1011/A1011M and complying with dimensional tolerances in ASTM A500/A500M; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A1011/A1011M.

C. Anchors, Fasteners, Fittings, and Hardware: [Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials]

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to [on]-grade substrate; [one per leg].
2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; [two per unit]

D. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
2. Hot-Dip Galvanizing: According to ASTM A123/A123M, ASTM A153/A153M, or ASTM A924/A924M.

2.3 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.

E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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.

2.5 STEEL AND GALVANIZED-STEEL FINISHES

A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and [securely anchored] at locations indicated on Drawings.

END OF SECTION