THE BOYS AND GIRLS CLUB

OF THE SOUTHERN UTE INDIAN TRIBE

RENOVATION AND SITE IMPROVEMENT PROJECT

PROJECT MANUAL
Project #25190

Construction Documents
August 31, 2026

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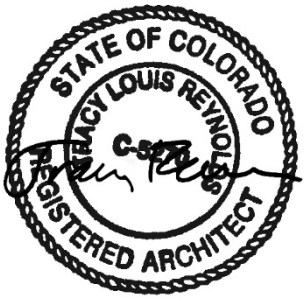
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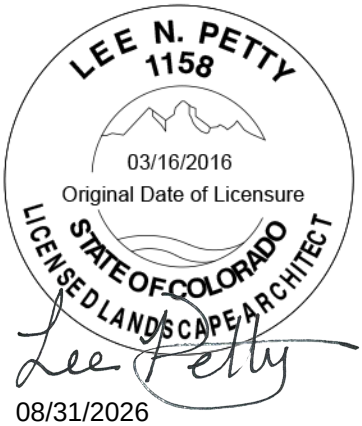
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TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

01 10 00	SUMMARY
01 20 00	PRICE AND PAYMENT PROCEDURES
01 21 00	ALLOWANCES
01 22 00	UNIT PRICES
01 23 00	ALTERNATES
01 25 00	SUBSTITUTION PROCEDURES
01 30 00	ADMINISTRATIVE REQUIREMENTS
01 40 00	QUALITY REQUIREMENTS
01 50 00	TEMPORARY FACILITIES AND CONTROLS
01 60 00	PRODUCT REQUIREMENTS
01 70 00	EXECUTION AND CLOSEOUT REQUIREMENTS
01 78 00	CLOSEOUT SUBMITTALS

DIVISION 02 - EXISTING CONDITIONS

02 41 00	DEMOLITION
01 56 39	TREE PROTECTION

DIVISION 03 - CONCRETE

03 30 00	CAST-IN-PLACE CONCRETE

DIVISION 05 - METALS

05 50 00	METAL FABRICATIONS
05 52 13	PIPE AND TUBE RAILINGS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 10 00	ROUGH CARPENTRY
06 20 00	FINISH CARPENTRY
06 41 00	ARCHITECTURAL WOOD CASEWORK

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 01 50.19	PREPARATION FOR RE-ROOFING
07 21 00	THERMAL INSULATION
07 25 00	WEATHER BARRIERS
07 26 00	VAPOR RETARDERS
07 27 00	AIR BARRIERS
07 41 13	METAL ROOF PANELS

07 42 13	METAL WALL PANELS
07 46 46	FIBER CEMENT SIDING
07 54 23	THERMOPLASTIC POLYOLEFIN ROOFING
07 62 00	SHEET METAL FLASHING AND TRIM
07 92 00	JOINT SEALANTS

DIVISION 08 - OPENINGS

08 11 13	HOLLOW METAL DOORS AND FRAMES
08 14 16	FLUSH WOOD DOORS
08 31 00	ACCESS DOORS AND PANELS
08 32 23	SLIDING AND FOLDING GLAZED WALLS AND DOORS
08 33 13	COILING COUNTER DOORS
08 43 13	ALUMINUM-FRAMED STOREFRONTS
08 71 00	DOOR HARDWARE
08 80 00	GLAZING
08 83 00	MIRRORS

DIVISION 09 - FINISHES

09 05 61	COMMON WORK RESULTS FOR FLOORING PREPARATION
09 21 16	GYPSUM BOARD ASSEMBLIES
09 24 00	CEMENT PLASTERING
09 30 00	TILING
09 51 00	ACOUSTICAL CEILINGS
09 54 23	LINEAR METAL CEILINGS
09 54 26	SUSPENDED WOOD CEILINGS
09 65 00	RESILIENT FLOORING
09 68 13	TILE CARPETING
09 91 13	EXTERIOR PAINTING
09 91 23	INTERIOR PAINTING

DIVISION 10 - SPECIALTIES

10 11 00	VISUAL DISPLAY UNITS
10 14 00	SIGNAGE
10 14 19	DIMENSIONAL LETTER SIGNAGE
10 21 13.17	PHENOLIC TOILET COMPARTMENTS
10 26 00	WALL AND DOOR PROTECTION
10 28 00	TOILET, BATH, AND LAUNDRY ACCESSORIES
10 44 00	FIRE PROTECTION SPECIALTIES

DIVISION 11 - EQUIPMENT

11 30 13 RESIDENTIAL APPLIANCES

DIVISION 12 - FURNISHINGS

12 21 13 HORIZONTAL LOUVER BLINDS
12 24 00 WINDOW SHADES
12 36 00 COUNTERTOPS

DIVISION 14 - CONVEYING EQUIPMENT

14 42 00 WHEELCHAIR LIFTS

DIVISION 21 – FIRE PROTECTION

21 05 00 COMMON WORK RESULTS FOR FIRE SUPPRESSION

DIVISION 22 - PLUMBING

22 05 00 COMMON WORK RESULTS FOR PLUMBING
22 07 00 PLUMBING INSULATION
22 10 00 PLUMBING PIPING AND PUMPS
22 30 00 PLUMBING EQUIPMENT
22 40 00 PLUMBING FIXTURES

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

23 05 00 COMMON WORK RESULTS FOR HVAC
23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
23 07 00 HVAC INSULATION
23 09 23 DDC BUILDING CONTROLS
23 11 00 FACILITY FUEL PIPING
23 20 00 HVAC PIPING AND PUMPS
23 30 00 HVAC AIR DISTRIBUTION
23 36 10 HEAT TRANSFER UNITS
23 52 00 HEATING BOILERS
23 64 23 AIR-COOLED SCROLL WATER CHILLERS
23 81 23 MINI SPLIT AIR CONDITIONERS

DIVISION 26 ELECTRICAL

26 05 00 COMMON WORK RESULTS FOR ELECTRICAL
26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 09 26	LIGHTING CONTROL SYSTEM
26 24 16	PANELBOARDS
26 43 13	SURGE PROTECTIVE DEVICE FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
26 5119	LED INTERIOR LIGHTING FIXTURES
26 5600	EXTERIOR LIGHTING SUPPORTS
26 5619	LED EXTERIOR LIGHTING

DIVISION 27 COMMUNICATIONS

27 05 00	COMMON WORK RESULTS FOR COMMUNICATIONS
27 15 23	COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING
27 15 13	COMMUNICATIONS COPPER HORIZONTAL CABLING

DIVISION 28 ELECTRICAL SAFETY AND SECURITY

28 15 00	ACCESS CONTROL HARDWARE DEVICES
28 20 00	VIDEO SURVEILLANCE
28 46 21.11	ADDRESSABLE FIRE ALARM SYSTEMS

DIVISION 31 - EARTHWORK

31 10 00	SITE CLEARING
31 22 00	GRADING
31 23 16	EXCAVATION
31 23 16.13	TRENCHING
31 23 16.26	ROCK REMOVAL
31 23 23	FILL

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 11 23	AGGREGATE BASE COURSES
32 12 16	ASPHALT PAVING
32 13 13	CONCRETE PAVING
32 15 40	CRUSHER FINES PAVING
32 31 13	FENCING
32 31 19	ORNAMENTAL FENCING
32 41 20	BOULDERS AND ROCKS
32 84 00	IRRIGATION SYSTEM
32 91 13	SOIL PREPARATION
32 91 19	TOPSOIL
32 92 23	SOD

32 93 00	PLANTINGS
32 93 01	MAINTENANCE`

DIVISION 33 - UTILITIES

33 01 10.58	DISINFECTION OF WATER UTILITY PIPING SYSTEMS
33 14 16	SITE WATER UTILITY DISTRIBUTION PIPING
33 31 13	SITE SANITARY SEWERAGE GRAVITY PIPING
33 40 00	STORM DRAINAGE UTILITIES – SLOT DRAIN AND DOWNSPOUT TRANSITION ASSEMBLIES

SECTION 00 01 10
TABLE OF CONTENTS

SPECIFICATIONS

1.01 DIVISION 01 -- GENERAL REQUIREMENTS

A. 01 10 00 - Summary
B. 01 20 00 - Price and Payment Procedures
C. 01 21 00 - Allowances
D. 01 22 00 - Unit Prices
E. 01 23 00 - Alternates
F. 01 25 00 - Substitution Procedures
G. 01 30 00 - Administrative Requirements
H. 01 40 00 - Quality Requirements
I. 01 50 00 - Temporary Facilities and Controls
J. 01 60 00 - Product Requirements
K. 01 70 00 - Execution and Closeout Requirements
L. 01 78 00 - Closeout Submittals

1.02 DIVISION 02 -- EXISTING CONDITIONS

A. 02 41 00 - Demolition

1.03 DIVISION 03 -- CONCRETE

A. 03 30 00 - Cast-in-Place Concrete

1.04 DIVISION 04 -- MASONRY

1.05 DIVISION 05 -- METALS

A. 05 50 00 - Metal Fabrications
B. 05 52 13 - Pipe and Tube Railings

1.06 DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

A. 06 10 00 - Rough Carpentry
B. 06 20 00 - Finish Carpentry
C. 06 41 00 - Architectural Wood Casework

1.07 DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

A. 07 01 50.19 - Preparation for Re-Roofing
B. 07 21 00 - Thermal Insulation
C. 07 25 00 - Weather Barriers
D. 07 26 00 - Vapor Retarders
E. 07 27 00 - Air Barriers
F. 07 41 13 - Metal Roof Panels
G. 07 42 13 - Metal Wall Panels
H. 07 46 46 - Fiber-Cement Siding
I. 07 62 00 - Sheet Metal Flashing and Trim
J. 07 92 00 - Joint Sealants

1.08 DIVISION 08 -- OPENINGS

A. 08 11 13 - Hollow Metal Doors and Frames

B. 08 14 16 - Flush Wood Doors
C. 08 31 00 - Access Doors and Panels
D. 08 32 23 - Sliding and Folding Glazed Walls and Doors
E. 08 33 13 - Coiling Counter Doors
F. 08 43 13 - Aluminum-Framed Storefronts
G. 08 51 13 - Aluminum Windows
H. 08 71 00 - Door Hardware
I. 08 80 00 - Glazing
J. 08 83 00 - Mirrors

1.09 DIVISION 09 -- FINISHES

A. 09 05 61 - Common Work Results for Flooring Preparation
B. 09 21 16 - Gypsum Board Assemblies
C. 09 24 00 - Cement Plastering
D. 09 30 00 - Tiling
E. 09 51 00 - Acoustical Ceilings
F. 09 54 23 - Linear Metal Ceilings
G. 09 65 00 - Resilient Flooring
H. 09 68 13 - Tile Carpeting
I. 09 91 13 - Exterior Painting
J. 09 91 23 - Interior Painting

1.10 DIVISION 10 -- SPECIALTIES

A. 10 11 00 - Visual Display Units
B. 10 14 00 - Signage
C. 10 14 19 - Dimensional Letter Signage
D. 10 21 13.17 - Phenolic Toilet Compartments
E. 10 26 00 - Wall and Door Protection
F. 10 28 00 - Toilet, Bath, and Laundry Accessories
G. 10 44 00 - Fire Protection Specialties

1.11 DIVISION 11 -- EQUIPMENT

A. 11 30 13 - Residential Appliances

1.12 DIVISION 12 -- FURNISHINGS

A. 12 21 13 - Horizontal Louver Blinds
B. 12 24 00 - Window Shades
C. 12 36 00 - Countertops

1.13 DIVISION 13 -- SPECIAL CONSTRUCTION

1.14 DIVISION 14 -- CONVEYING EQUIPMENT

A. 14 42 00 - Wheelchair Lifts

1.15 DIVISION 21 -- FIRE SUPPRESSION

1.16 DIVISION 22 -- PLUMBING

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

1.18 DIVISION 25 -- INTEGRATED AUTOMATION

1.19 DIVISION 26 -- ELECTRICAL

1.20 DIVISION 27 -- COMMUNICATIONS

1.21 DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY

1.22 DIVISION 31 -- EARTHWORK

A. 31 10 00 - Site Clearing
B. 31 22 00 - Grading
C. 31 23 16 - Excavation
D. 31 23 16.13 - Trenching
E. 31 23 16.26 - Rock Removal
F. 31 23 23 - Fill

1.23 DIVISION 32 -- EXTERIOR IMPROVEMENTS

A. 32 11 23 - Aggregate Base Courses
B. 32 12 16 - Asphalt Paving
C. 32 13 13 - Concrete Paving
D. 32 84 23 - Underground Sprinklers
E. 32 92 19 - Seeding
F. 32 93 00 - Plants

1.24 DIVISION 33 -- UTILITIES

A. 33 01 10.58 - Disinfection of Water Utility Piping Systems
B. 33 14 16 - Site Water Utility Distribution Piping
C. 33 31 13 - Site Sanitary Sewerage Gravity Piping
D. 33 42 11 - Stormwater Gravity Piping
E. 33 42 30 - Stormwater Drains

1.25 DIVISION 34 -- TRANSPORTATION

1.26 DIVISION 40 -- PROCESS INTEGRATION

1.27 DIVISION 46 -- WATER AND WASTEWATER EQUIPMENT

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: A Renovation for The Boys and Girls Club of the Southern Ute Indian Tribe-, Ignacio, CO.

B. Owner's Name: Southern Ute Indian Tribe.

C. Architect's Name: Reynolds Ash + Associates, Durango, C.

D. Additional Project contact information is provided on the Project Directory.

E. The Project consists of the renovation of the existing building located at 296 Mouache Drive, Ignacio, CO. The project scope includes the renovation of the 8,917 sq. ft two-story building and identified site improvements.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract as described in AIA Document A133-2019 'Standard Form of Agreement Owner and Construction Manager as Constructor where basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price'.

B. Contract Type: Project will be constructed under a Construction Manager/ General Contractor (CMGC) agrrement.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.

B. Scope of alterations work is indicated on drawings.

C. Plumbing: Remove all old systems, add new construction per plans.

D. HVAC: Remove all old systems, and add new construction per plans.

E. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.

F. Fire Suppression Sprinklers: A new fire suppression system to be installed throughout the building.

G. Fire Alarm: Replace existing system with new construction.

H. Telephone: Remove all old wiring and system components, add new construction per plans.

I. Owner will remove the following items before start of work in the renovation areas of the project:
   1. Furnishings.
   2. Small office equipment.

J. Contractor is required to remove and store the following prior to start of work, for later reinstallation by Contractor:
   1. Payphone/telephone.
   2. If the Contractor finds anything extraordinary such as time capsules or other culturally significant items, contractor shall notify the Southern Ute Indian Tribe..
   3. Building dedication plaques.

1.04 WORK BY OWNER

A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Date of Substantial Completion. Some items include:
   1. N/A.

1.05 OWNER OCCUPANCY

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

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

C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Contractor to prepare site utilization plan showing proposed use of site during the variosu phases of the construction period.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of the periphery of the project site to still allow for the campus and adjacent facilities to be accessed and easily used by the community:

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

D. Time Restrictions:
   1. Limit conduct of especially noisy exterior work to the hours of 8:00 am- 5:00 pm.
   2. Work may be performed inside the existing building 7:00 am - 6:00 pm Monday through Friday.
   3. Work may be performed inside the building during extended work hours and on weekends to maintain the project scheduled upon approval by the Owner.

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

1.07 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Contract Type: A single prime contract as described in AIA Document A133-2019 *'Standard Form of Agreement Owner and Construction Manager as Constructor where basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price*'.

B. Section 01 21 00 - Allowances: Payment procedures relating to allowances.

C. Section 01 22 00 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

D. Section 01 78 00 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

F. Execute certification by signature of authorized officer.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

I. Submit electronic copies of each Application for Payment, unless owner requests otherwise.

J. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 30 00.
   2. Construction progress schedule, revised and current as specified in Section 01 30 00.
   3. Partial release of liens from major subcontractors and vendors.
   4. Affidavits attesting to off-site stored products.

K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 days.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.
   4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

F. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:

a. Origin and date of claim.
b. Dates and times work was performed, and by whom.
c. Time records and wage rates paid.
d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

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

B. Application for Final Payment will not be considered until the following have been accomplished:

1. All closeout procedures specified in Section 01 78 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

B. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts, less cost of delivery to site , less applicable taxes .

B. Costs Not Included in Cash Allowances: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing.

C. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products, suppliers , and installers.
   2. Select products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Change Order.

D. Contractor Responsibilities:
   1. Assist Architect in selection of products, suppliers, and installers.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
   5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

E. Differences in costs will be adjusted by Change Order.

1.04 QUANTITY ALLOWANCES

A. Allowances shall include cost to Contractor of specific products, work items and materials ordered by Owner or selected by Architect under each designated allowance and shall include taxes, freight and delivery to the Project site.

1.05 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust Contract Sum for each designated Quantity Allowance, prepare final reconciliation Change Order proposal based on the agreed upon difference between actual field measured quantity and the established base bid allowance quantity, multiplied by the contract Unit Price.

B. Allowance Adjustment: To adjust Contract Sum for each designated Dollar Value Allowance, prepare a Change Order proposal based on the difference between purchase amount and the established allowance amount included in the base bid Contract Sum.

1.06 ALLOWANCES SCHEDULE

A. Section 10 14 00 - Signage: Include the stipulated sum of $ 10,000 for purchase and delivery of interior signage. Installation cost included in Base Bid scope.

B. Section Exterior Signage: Include the stipulated sum of $15,000 for purchase and delivery of exterior building signage. Installation cost included in Base Bid scope

C. Section 11 30 13 - Residential Appliances and Food service equipment: Include the stipulated sum of $_28,000__ for purchase and deliver of residential appliances. Installation cost included in Base Bid scope.

D. Section 12 21 00 - Horizontal Louver Blinds: Include the stipulated sum of $_14,000__ for purchase, delivery and installation of interior window blinds.

E. Section 12 24 00 - Window Shades: Include the stipulated sum of $_28,000___ for purchase, delivery and installation of interior window shades.

F. Section Specialty Graphics: Include the stipulated sum of $14,000 for purchase, delivery, and installation of vinyl wall wraps..

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 22 00
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

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

C. Defect assessment and non-payment for rejected work.

1.02 RELATED REQUIREMENTS

A. Document: Unit Prices Form: List of Unit Prices as supplement to Bid Form.

B. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

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

1.04 UNIT QUANTITIES SPECIFIED

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

1.05 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Owner.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement Devices:
   1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
   2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
   3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.

E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

F. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

G. Measurement by Area: Measured by square dimension using mean length and width or radius.

H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

I. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

J. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

K. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes , calculate and certify quantities for payment purposes.

1.06 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.07 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
   1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect.
   2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Architect to assess the defect and identify payment adjustment is final.

1.08 SCHEDULE OF UNIT PRICES

A. The following Unit Prices are applicable to site work identified on the drawings. The Contractor shall provide a unit price applicable for additive and deductive work required for Base Bid and Add Alternate scope of work.

B. Item: A; Removal of Unsuitable Soils Materials.
   1. Description: Added or deleted removal of unsuitable soil encountered during site or building excavation including soil excavation not shown in the contract documents. Unit price includes the cost for proper disposal off site. Refer to specification Section 31 23 16- Excavation.
   2. Unit of Measurement: Cubic yard of soil excavated, based on agreed upon field measured volume of additional unsuitable soil excavation and removal not shown in the contract documents.
      a. Excavating Soils Material: By the cubic yard for additional or reduced excavation work below foundations and slab on grade infill, and exterior paving.
   3. The cost for excavation and removal of general soil material to the lines and grades indicated on the drawings and specifications shall be included in the Base Bid price.
      a. Payment will not be made for over-excavation work nor for replacement materials identified on the drawings and specifications.
   4. Quantity to be included in Base Bid:
      a. Contractor to include the depth and extent of over-excavation shown on the structural drawings and details.

C. Item: B; Additional or Reduced Structural Fill.
   1. Description: Added or deleted installation of structural fill material shown in the contract documents in accordance with specification Section 31 23 23- Structural Fill.
      a. Class 6 Aggregate Base Course: By the cubic yard. Include supplying fill material, stockpiling, placing to required elevations and compaction. Provide cost per cubic yard for additional or reduced strictural fill below concrete foundations including footings, interior slab on grade and exterior concrete flatwork and asphalt paving.

2. Unit of Measurement: Cubic yard of structural fill based on agreed-upon field measured volume of structural fill materials.

D. Item: C; Additional or Reduced Foundation Concrete.
   1. Description: Added or deleted concrete foundation work including formwork, reinforcing steel and concrete placements in accordance with Section 03 30 00- Cast in-Place Concrete.
   2. Unit of Measurement: Cubic yard of added or deleted concrete for building foundation work, based on agreed-upon field measured volume of concrete foundation scope.

E. Item: D; Additional or Reduced Rock Removal.
   1. Description: Added or deleted rock excavation and disposal off-site, in accordance with contract documents.
      a. Refer to specification Section 31 23 16.26- Rock Removal for definition of the size of boulders that would be removed under Site Rock or Trench Rock excavation and removal.
         1) Site Rock Removal
         2) Trench Rock Removal
   2. Unit of Measurement: Cubic yard of rock excavated, based on agreed-upon field measured volume of site rock and trench rock encountered.
   3. Quantity Allowance:
      a. Include 40 cubic yards of site rock removal with the intial Contract Sum. Coordinate unit with allowance adjustment requirements in Section 01 21 00- Allowances.
      b. Include 20 cubic yards of trench rock removal with the intial Contract Sum. Coordinate unit with allowance adjustment requirements in Section 01 21 00- Allowances

F. Item: E; Concrete Paving.
   1. Decription: Added or deleted concrete paving including subgrade preparation, aggregate base, and concrete placement and finishing in accordance with Section 32 13 13- Concrete Paving, unless otherwise indicated in the contract documents.
   2. Unit of Measurement: Square feet of added or deleted concrete paving based on agreed-upon field measured area of concrete paving.

G. Item: F; Topsoil.
   1. Decription: Added imported topsoil in accordance with Section 31 22 00- Grading, unless otherwise indicated in the contract documents. Cost includes importing suitable topsoil form stockpiles, or approved pits. It shall include the placing of the topsoil after construction and grading operations are completed.
   2. Unit of Measurement: Cubic yard of added imported topsoil based on agreed-upon field measured area of topsoil.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

A. Document- Bid Alternate Form: List of alternates as supplement to Bid Form.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1

B. Alternate No. A1 - SUNSHADES AND POSTS:
   1. Base Bid: Do not include any scope related to the sunshades.
   2. Alternate Item: Include the steel posts per structural including foundations, include the sunshades themselves (Polyfab sunshades as basis of design) in the size and quantity shown in the drawings.

C. Alternate No. A2 - UTILITY YARD ENCLOSURE:
   1. Base Bid: Custom steel frame and metal panel structure that is currently designed.
   2. Alternate Item: Include a black vinyl coated chain link fece with black slats in lieu of the custom enclosure.

D. Alternate No. A3 - LED INSERT AT MONUMENT SIGN :
   1. Base Bid: Provide the monument as currently shown except for remove the LED digital sign including pulling power and data to the sign.Include rough in for power and data only.
   2. Alternate Item: Provide the monument sign in its entirely as currently shown including the LED/digital screen on one side. Include pulling power and data to the sign.

E. Alternate No. A4 - Metal Panel Color Change.:
   1. Base Bid: Provide MP-2 as shown to be antique bronze (standard Morin color)
   2. Alternate Item: Provide MP-2 to be champagne bronze (upgraded metallic finish and color). All other specs remain the same in terms of panel profile, etc.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 01 21 00 - Allowances, for cash allowances affecting this section.

B. Section 01 22 00 - Unit Prices, for additional unit price requirements.

C. Section 01 23 00 - Alternates, for product alternatives affecting this section.

D. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.

E. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

B. Substitutions: See General Conditions for definition.

1.04 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

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

1. Note explicitly any non-compliant characteristics.

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

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

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

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

B. Submittal Form (before award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request (After Bidding/Negotiating). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Architect will consider requests for substitutions only within 15 days after date of Agreement.

C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

D. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
      b. Other construction by Owner.
      c. Other unanticipated project considerations.

E. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

3.07 ATTACHMENTS

A. A facsimile of the Substitution Request Form (During Procurement and During Construction) required to be used on the Project is included after this section.

END OF SECTION

SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

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Form Version: September 2013
CSI Form 1.5C

SUBSTITUTION REQUEST

(After the Bidding/Negotiating Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

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CSI Form 13.1A

SUBSTITUTION REQUEST

(After the Bidding/Negotiating Phase — Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: ☐

A/E's REVIEW AND RECOMMENDATION

☐ Approve Substitution - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Approve Substitution as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Reject Substitution - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

OWNER'S REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.
☐ Substitution rejected - Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐Contractor ☐Subcontractor ☐Supplier ☐Manufacturer ☐A/E

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Form Version: September 2013
CSI Form 13.1A

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Construction progress schedule.

G. Coordination drawings.

H. Submittals for review, information, and project closeout.

I. Number of copies of submittals.

J. Requests for Interpretation (RFI) procedures.

K. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. AIA Document A201-2017 '*General Conditions of the Contract for Construction*': Dates for application for payment.

B. Section 01 60 00 - Product Requirements: General product requirements.

C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
2. Contractor and Architect are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: Use one of the following:
1. [Procore]: www.procore.com
2. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.
3. EADOC LLC (tel: 1-877-305-3844): www.eadocsoftware.com/#sle.
4. Newforma ConstructEx: www.newforma.com/our-solutions/constructex/#sle.
5. Prolog Converge: www.trimble.com/products/constructex/#sle

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
1. Representatives of Owner are scheduled and included in this training.

D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

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

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

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

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Schedule meeting at the Project site prior to Contractor occupancy.

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

C. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements.
   3. Construction facilities and controls provided by Owner.
   4. Temporary utilities provided by Owner.
   5. Survey and building layout.
   6. Security and housekeeping procedures.
   7. Schedules.
   8. Application for payment procedures.
   9. Procedures for testing.
   10. Procedures for maintaining record documents.
   11. Requirements for start-up of equipment.
   12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

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

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

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

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

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

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

D. Submit updated schedule with each Application for Payment.

3.06 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.07 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Owner.
   3. Prepare using software provided by the Electronic Document Submittal Service.
   4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.

4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
    a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.08 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Coordinate with Contractor's construction schedule and schedule of values.
   2. Format schedule to allow tracking of status of submittals throughout duration of construction.
   3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

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

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Final Property Survey.

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

3.12 NUMBER OF COPIES OF SUBMITTALS

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

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

3.13 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   3. Transmit using approved form.
      a. Use form generated by Electronic Document Submittal Service software.
   4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Upload submittals in electronic form to Electronic Document Submittal Service website.
   8. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
      c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
   9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   10. Provide space for Contractor and Architect review stamps.
   11. When revised for resubmission, identify all changes made since previous submission.
   12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   14. Submittals not requested will be recognized, and will be returned "Not Reviewed",

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

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Do not reproduce Contract Documents to create shop drawings.

3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.14 SUBMITTAL REVIEW

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

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

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "Approved", or language with same legal meaning.
b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
2. Not Authorizing fabrication, delivery, and installation:
a. "Revise and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.
2) Non-responsive resubmittals may be rejected.
b. "Rejected".
1) Submit item complying with requirements of Contract Documents.

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

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
B. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2026.
B. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing of Soil and Rock as Used in Engineering Design and Construction; 2026.

1.04 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
    1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
        a. Full name.
        b. Professional licensure information.
        c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
    1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
    2. Include required product data and shop drawings.
    3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.

4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
   2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit report in duplicate within 30 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.07 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Notify Architect and Owner's Representative fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
   2. Make corrections as necessary until Architect's approval is issued.

H. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.

b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
c. To facilitate tests/inspections.
d. To provide storage and curing of test samples.

4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

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

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.03 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical power and metering, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. Provide and pay for all lighting, heating and cooling, and ventilation required for construction purposes.

C. Existing facilities may be used, upon approval by Owner.

D. New permanent facilities may be used.

E. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

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

B. Telecommunications services shall include:
   1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
   2. Internet Connections: Minimum of one; DSL modem or faster.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

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

1.07 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Provide graphics for project and owner as requested on fence.

1.08 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.09 SECURITY

A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

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

C. Provide and maintain access to fire hydrants, free of obstructions.

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

E. Existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

G. Existing parking areas located at site may be used for construction parking. Coordinate use with Owner during early stages of construction.

1.11 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.13 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

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

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Lists of products to be removed from existing building.

B. Section 01 10 00 - Summary: Identification of Owner-supplied products.

C. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

D. Section 01 40 00 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

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

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

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

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
   1. See Section 01 10 00 and the demolition drawings for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

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

B. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.
   2. Made of wood from newly cut old growth timber.
   3. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.
   2. Are made of vegetable materials that are rapidly renewable.
   3. Are made of recycled materials.

2.03 PRODUCT OPTIONS

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

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 25 00 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

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

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

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

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

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

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

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

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

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

F. For exterior storage of fabricated products, place on sloped supports above ground.

G. Provide off-site storage and protection when site does not permit on-site storage or protection.
   1. Execute a formal supplemental agreement between Owner and Contractor allowing off-site storage, for each occurrence.

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

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

J. Do not store products directly on the ground.

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

L. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

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

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

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

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 01 50 00-Temporary Facilities and Controls: Temporary heating, cooling, and ventilating facilities.

G. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

H. Section 07 84 00 - Firestopping.

I. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
2. Identify demolition firm and submit qualifications.
3. Include a summary of safety procedures.

D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.

E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Perform dewatering activities, as required, for the duration of the project.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
1. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
2. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
2. Indoors: Limit conduct of especially noisy interior work to 8 am to 5 pm.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.07 COORDINATION

A. See Section 01 10 00 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.
   2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. See Section 01 10 00 for other limitations on outages and required notifications.
      c. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

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

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.12 ADJUSTING

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

B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

3.13 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Owner's Representative on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Owner will occupy portions of the building as specified in Section 01 10 00.

F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Materials transparency manual.

D. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Materials Transparency Manual:
   1. Compile and submit a digital and a printed version of information disclosing materials content for interior finishes, furnishings (including workstations), built-in furniture. Meet IWBI (BS) requirements for format and content.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

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

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

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
3. Field changes of dimension and detail.
4. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

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

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

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

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
   1. Include HVAC outdoor and exhaust air damper calibration strategy.
      a. Include provisions which ensure that full closure of dampers can be achieved.
   2. Include Carbon Dioxide Monitoring Protocol.
   3. Include Carbon Monoxide Monitoring Protocol.

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

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

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

M. Include test and balancing reports.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

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

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

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

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

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

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

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

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration purposes.

D. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 10 00 - Summary: Sequencing and staging requirements.

C. Section 01 10 00 - Summary: Description of items to be removed by Owner.

D. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

E. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

F. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

G. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

H. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

I. Section 02 65 00 - Underground Storage Tank Removal.

J. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; earth stripping and stockpiling.

K. Section 31 22 00 - Grading: Rough and fine grading.

L. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

M. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

N. Section 32 91 19 - Landscape Grading: Topsoil placement and finish grading.

O. Section 32 93 00 - Plants: Relocation of existing trees, shrubs, and other plants.

1.03 DEFINITIONS

A. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

C. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

D. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Site Utilization Plan: Contractor to submit site plan showing the proposed location for:
   1. Areas for temporary construction and field offices.
   2. Areas for contractor and subcontractor parking both on site, and on teh adjacent lot at the northwest corner of the project site owned by the Owner.
   3. Areas for temporary and permanent placement of removed material.
   4. Access and egress from the existing Library building during the construction period.

C. Site Plan: Indicate:
   1. Vegetation to be protected.

D. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
   1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
   2. Demolition firm qualifications.

E. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

A. Remove portions of existing building as indicated on the demolition drawings.

B. Remove existing underground grease trap and associated piping.

C. Remove fences and gates as indicated on the demolition drawing.

D. Remove designated concrete sidewalks and exterior slabs on grade within site boundaries.

E. Remove other items indicated, for salvage and relocation.

F. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 01 70 00.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public. Comply with IBC Div 33.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permits from the Southern Ute Indian Tribe.
   7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.

8. Obtain written permission from the Southern Ute Indian Tribe when demolition equipment will traverse, infringe upon, or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged or relocated have been removed.

E. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

G. Hazardous Materials:
   1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

H. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

J. Underground Storage Tanks: Remove and dispose of as specified in Section 02 65 00.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.
   2. Provide sound retardant partitions of construction and in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

D. Remove existing work as indicated and required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
   2. Remove items indicated on drawings.

E. Services including, but not limited to, HVAC, Plumbing, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. See Section 01 10 00 - Summary for limitations on outages and required notifications.
   4. Verify that abandoned services serve only abandoned facilities before removal.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch to match new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 01 56 39
TREE PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Contract Conditions, Drawings and other Division 1 Specification sections apply to work of this Section.

1.02 DESCRIPTION

A. This section includes the protection of trees that interfere with, or are affected by, execution of the work, whether temporary or new construction.

1.03 RELATED SECTIONS

A. NA

1.04 SUBMITTALS

A. As specified in Section 01 30 00.

B. Product Data: For each type of product indicated.

C. List of references for tree work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fence: Manufacturer's standard, orange construction fence. 48” tall.

B. 6-foot steel stakes, painted green, penetrate the ground to 24 inches.

C. Wire ties.

PART 3 EXECUTION

3.01 PREPARATION

A. Temporary Fencing: Install temporary fencing located as indicated, or outside the drip line of trees to protect remaining vegetation from construction damage.

B. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing or storing construction materials. Protect root systems from flooding, eroding or excessive wetting caused by dewatering operations.

C. Do not store construction materials, debris or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line; prevent soil compaction over root systems.

3.02 EXCAVATION

A. Do not excavate within drip line of trees, unless otherwise indicated.

B. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

1. Relocate roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 2 inches (75 mm) back from new construction as directed by the City Arborist.
2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil as directed by the City Arborist.

C. Where utility trenches are required within drip line of trees, tunnel under or around roots by drilling, auger boring, pipe jacking or digging by hand.

3.03 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs and roots according to written instructions of the Landscape Architect.

B. Remove and replace dead and damaged trees that the by the Landscape Architect. determines to be incapable of restoring to normal growth pattern.

3.04 TREE TRIMMING AND ROOT PRUNING

A. All root pruning shall be performed with sharp tools that leave a clean, crisp cut at root end for proper healing. Ripping or tearing of roots shall be avoided at all times when working around all trees.

B. Contractor shall not prune any roots greater than 2” without approval of by the Landscape Architect.

C. Prior to beginning any construction, removal, trimming, and pruning of encroaching vegetation (as indicated on the project drawings and as determined by the Engineer) shall be completed.

D. Once all directed clearing, trimming, and pruning is completed and accepted, no additional clearing, trimming, cutting, or pruning will be allowed unless approved, in writing, by the Landscape Architect.

E. This work shall be done only by a contractor or subcontractor who is a qualified Arborist or Tree Care Company.

F. The firm's or individual's name and qualifications shall be submitted at the preconstruction conference. A list of references and other clients shall be included with the qualifications statement. A written description of work methods and time schedules shall be submitted and approved in writing by the Engineer prior to work commencing.

G. Access for the removal or pruning of trees will be extremely limited. Trees shall be felled at the risk of the Contractor. Strict limits of disturbance will be defined and shall be adhered to.

H. Branches on trees or shrubs shall be removed as directed by the Landscape Architect. All trimming shall be done by skilled workmen. All work shall be done according to the following requirements:
   1. Pruning shall be done with proper, sharp, clean tools in such a manner as to preserve the natural character of the tree.
   2. All final pruning cuts shall be made to branch collar.
   3. To avoid bark stripping, all branches 50 mm (2 inches) in diameter and larger shall be cut using the 3-cut method. These branches shall be lowered to the ground by proper ropes.
   4. Tools used on trees known or found to be diseased, shall be disinfected with alcohol before they are used on other trees.
   5. Structural weaknesses, decayed trunk or branches, or split crotches shall be reported to the City Arborist.
   6. When performing Crown Reduction Methods, the Contractor shall use the drop-crotch method and avoid cutting back to small suckers. Smaller limbs and twigs shall be removed in such a manner so as to leave the foliage pattern evenly distributed.
   7. When performing Crown Reduction a 3/1 reduction method shall be used when reducing size. The total area shall be reduced at a single operation.
   8. Climbing spikes shall not be used on trees not scheduled for removal.
   9. Grind stumps to minimum of 6 inches below finished grade. Remove stump balls under hardscape locations.

3.05 DISPOSAL

A. Remove trash, debris and waste material, and legally dispose of it off the property in a timely manner.

B. Burning is not permitted.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete foundation walls.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Concrete Construction; 2020.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

D. ACI 306R - Guide to Cold Weather Concreting; 2016.

E. ACI 308R - Guide to External Curing of Concrete; 2016.

F. ACI 318 - Building Code Requirements for Structural Concrete; 2019, with Errata (2021).

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2022a.

J. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

K. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

L. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

M. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

N. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2022.

O. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017.

P. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

Q. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

R. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2018.

S. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

T. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Test Reports: Submit report for each test or series of tests specified.

F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. For slabs required to include moisture vapor reducing admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Slabs with Porosity Inhibiting Admixture (PIA) or Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover cost of flooring failures due to moisture migration from slabs for life of the concrete.
   1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Moisture Vapor Reducing Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs). Closes capillary systems formed during concrete curing to reduce moisture vapor emission and transmission. Reduces concrete shrinkage with no adverse effect on concrete properties or applied flooring.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   2. Products:
      a. Raven Industries; VAPORBLOCK VB15; 15-mil (Class B & C); www.VaporBlock.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

2.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

C. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3000 PSI for footings, 3500 PSI for stemwalls and interior flatwork, 4000 PSI for exterior flatwork.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Water-Cement Ratio: Maximum 40 percent by weight.
   4. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M. Exterior exposed concrete shall have from 5 to 7% entrained air.
   5. Maximum Slump: 4" for footings and stemwalls, 5" for interior or exterior flatwork.
   6. Maximum Aggregate Size: 5/8 inch.

2.09 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

D. Do not use shrinkage-reducing admixture (SRA) in same concrete batch with MVRA or PIA.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

E. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 CONCRETE FINISHING

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
3. Final Curing: Begin after initial curing but before surface is dry.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

H. Slab Testing: Cooperate with manufacturer of specified moisture vapor reducing admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.08 DEFECTIVE CONCRETE

A. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

B. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.09 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting: Paint finish.

B. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Errata (2026).

I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

K. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

B. Lintels: As detailed; prime paint finish.

C. Door Frames for Overhead Door Openings and Wall Openings: Channel and Angle sections; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

A. Section 05 51 00 - Metal Stairs: Attachment plates for handrails specified in this section.

B. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

C. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.

D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Errata (2026).

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

C. Fabricator Qualifications:

1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to stud walls, provide backing plates, for bolting anchors.

G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Weld connections that cannot be shop welded due to size limitations.
   1. Weld in accordance with AWS D1.1/D1.1M.
   2. Match shop welding and bolting.
   3. Clean welds, bolted connections, and abraded areas.
   4. Touch up shop primer and factory-applied finishes.
   5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 SCHEDULE

A. Multi-Purpose Room 102- Interior Stair:
   1. Wall mounted handrail.
   2. Stair mounted guard and handrail.

B. Corridor 120/ Corridor 213 Stair:
   1. Wall mounted handrail.

C. Loft 201:
   1. Floor mounted guard.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Nonstructural dimension lumber framing.

C. Rough opening framing for doors, windows, and roof openings.

D. Sheathing.

E. Roofing nailers.

F. Preservative treated wood materials.

G. Miscellaneous framing and sheathing.

H. Communications and electrical room mounting boards.

I. Concealed wood blocking, nailers, and supports.

J. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

B. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

C. Section 07 27 00 - Air Barriers: Air barrier over sheathing.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

E. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.

F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2022.

G. PS 1 - Structural Plywood; 2009 (Revised 2019).

H. PS 2 - Performance Standard for Wood Structural Panels; 2018.

I. PS 20 - American Softwood Lumber Standard; 2021.

J. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Allowed under referenced grading rules.
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
   1. Species: Allowed under grading rules.
   2. Grade: No. 1 and Better.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 STRUCTURAL COMPOSITE LUMBER

A. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
   1. Columns: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published modulus of elasticity, E: 1,800,000 psi, minimum.
   2. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published modulus of elasticity, E: 1,800,000 psi, minimum.
   3. Products:
      a. Boise Cascade Company: www.bc.com/#sle.
      b. RedBuilt LLC; Redbuilt Laminated Veneer Lumber: www.redbuilt.com//#sle.
      c. Roseburg Forest Products; RigidLam LVL: www.roseburg.com/#sle.
      d. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 CONSTRUCTION PANELS

A. Roof Sheathing: Oriented strand board structural wood panel, PS 2, with factory laminated roofing underlayment layer.
   1. Sheathing Panel:
      a. Grade: Structural 1 Sheathing.
      b. Size: 4 feet wide by 8 feet long.
      c. Performance Category: 5/8 PERF CAT.
      d. Span Rating: 40/20.

e. Edge Profile: Square edge.

B. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
1. Grade: Structural 1 Sheathing.
2. Bond Classification: Exposure 1.
3. Performance Category: 1/2 PERF CAT.
4. Span Rating: 32/16.
5. Edges: Square.
6. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.05 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
3. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

D. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.

E. Water-Resistive Barrier: See Section 07 25 00.

F. Air Barrier: See Section 07 27 00.

2.06 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
1. Products:
a. Lonza Group: www.wolmanizedwood.com/#sle.
b. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com/#sle.
c. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
b. Treat lumber in contact with roofing, flashing, or waterproofing.
3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

b. Treat plywood in contact with roofing, flashing, or waterproofing.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges use sheathing clips where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
   1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

A. Waste Disposal: See Section 01 70 00- Execution and Closeout Requirements.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

C. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 41 00 - Architectural Wood Casework: Shop fabricated custom cabinet work.

C. Section 08 14 16 - Flush Wood Doors.

D. Section 09 91 13 - Exterior Painting: Painting of finish carpentry items.

E. Section 09 91 23 - Interior Painting: Painting of finish carpentry items.

F. Section 09 93 00 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2022.

E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

F. NHLA G-101 - Rules for the Measurement and Inspection of Hardwood and Cypress; 2019.

G. PS 1 - Structural Plywood; 2009 (Revised 2019).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.
   2. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.

D. Samples: Submit two samples of wood trim 6 inch long.

E. Samples: Submit two samples of 1x4 tongue and groove soffit boards; 6 inch long.

F. Manufacturer's Instructions: Provide manufacturer's installation instructions for factory-fabricated units.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Exterior Woodwork Items:
   1. items as Noted on the Drawings: Softwood; prepare for paint finish.

B. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear fir; prepare for stained finish.

2.02 LUMBER MATERIALS

A. Softwood Lumber: Idaho White, Lodgepole, Ponderosa or Sugar Pine species, plain sawn, maximum moisture content of 6 percent, WWPA D Select quality.
   1. Grading: In accordance with rules certified by ALSC; www.alsc.org.

B. Hardwood Lumber-Interior: White Maple species, plain sawn, maximum moisture content of 6 percent ; with vertical grain , of quality suitable for transparent finish.
   1. Grading: In accordance with NHLA G-101 Grading Rules; www.nhla.org.

2.03 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.04 PANEL CORE MATERIALS

A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
   1. Panel Thickness: 3/4 inch.
   2. Products:
      a. Roseburg Forest Products; Medium Density Fiberboard: www.roseburg.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.

C. Fasteners: Of size and type to suit application; plain finish in concealed locations and non-corrosive finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

2.06 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Lumber for Shimming, Blocking, and Furring: Softwood lumber of pine species.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 WOOD TREATMENT

A. Wood Preservative by Pressure Treatment (PT Type): Provide AWPA U1 treatment using waterborne preservative with 0.25 percent retainage.

B. Redry wood after pressure treatment to maximum 19 percent moisture content.

2.08 SITE FINISHING MATERIALS

A. Field Finishing: See Section 09 91 23.

2.09 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.10 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.04 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 91 13 and 09 91 23.

3.05 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Hardware.

D. Factory finishing.

E. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

E. BHMA A156.9 - Cabinet Hardware; 2020.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade. Colors to be selected by Architect.

C. Breakroom Cabinets: Plastic laminate faced, Custom grade.

D. Cabinets throughout the building where shown per construction drawings.
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Finish - Exposed Interior Surfaces: Decorative laminate.
   3. For locations that will be used as benches and seating: Wood
   4. Adjustable Shelf Loading: 40 psf.
   5. Cabinet Style: Flush overlay.
   6. Cabinet Doors and Drawer Fronts: Flush style.

2.03 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.04 PANEL CORE MATERIALS

A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
   1. Grade: M-2; moisture resistance: MR10.
   2. Panel Thickness: 3/4 inch.
   3. Products:
      a. Roseburg Forest Products; Particleboard: www.roseburg.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
   1. Grade: 115; moisture resistance: MR10.
   2. Panel Thickness: 3/4 inch.
   3. Products:
      a. Roseburg Forest Products: www.roseburg.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 THERMALLY FUSED LAMINATE PANELS

A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
   1. Test in accordance with NEMA LD 3 Section 3.
   2. Panel Core Substrate: Particleboard.
   3. Color: White.
   4. Products:
      a. Roseburg Forest Products; Thermally Fused Laminate: www.roseburg.com/#sle.
      b. Wilsonart LLC; Thermally Fused Laminate Panels: www.wilsonart.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 LAMINATE MATERIALS

A. Manufacturers:
   1. Wilsonart LLC: www.wilsonart.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as indicated. Color to match existing wood, Walnut, or similar, Final selection by Architect.
   1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, color as selected, finish as indicated.
   2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, color as selected, finish as indicated.

2.07 COUNTERTOPS

A. Countertops: See Section 12 36 00.

2.08 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.
   1. Manufacturers:
      a. Franklin International, Inc; Titebond Original Wood Glue: www.titebond.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's standard range.
   2. Use at all exposed shelf edges.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

F. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.09 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.
   1. Materials: Steel; T-shape cross-section.
      a. Finish: Manufacturer's standard, factory-applied, powder coat.
      b. Color: White.
   2. Products:
      a. A&M Hardware, Inc; Hybrid Brackets: www.aandmhardware.com/#sle.
      b. A&M Hardware, Inc; Heavy-Duty Hybrid Brackets: www.aandmhardware.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.

D. Keyed Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

E. Cabinet Catches and Latches:
   1. Type: Push latch.
   2. Manufacturers:
      a. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

F. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.

4. Stops: Integral type.
5. Features: Provide self closing/stay closed type.
6. Manufacturers:
   a. Accuride International, Inc; Heavy-Duty Drawer Slides: www.accuride.com/#sle.
   b. Blum, Inc; STANDARD: www.blum.com/#sle.
   c. Grass America Inc: www.grassusa.com/#sle.
   d. Hettich America, LP: www.hettich.com/#sle.
   e. Knape & Vogt Manufacturing Company; Medium-Duty Drawer Slides: www.knapeandvogt.com/#sle.
   f. Substitutions: See Section 01 60 00 - Product Requirements.

G. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
1. Manufacturers:
   a. Blum, Inc; CLIP top BLUMOTION: www.blum.com/#sle.
   b. Blum, Inc; COMPACT BLUMOTION: www.blum.com/#sle.
   c. Grass America Inc: www.grassusa.com/#sle.
   d. Hardware Resources: www.hardwareresources.com/#sle.
   e. Hettich America, LP: www.hettich.com/#sle.
   f. Substitutions: See Section 01 60 00 - Product Requirements.

2.10 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use concealed joint fasteners to align and secure adjoining cabinet units.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

D. Secure cabinets to floor using appropriate angles and anchorages.

E. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Replacement of existing roofing system in preparation for entire new roofing system.

B. Partial replacement of existing roofing system in preparation for replacement roofing system in designated areas as indicated on drawings.

C. Removal of existing flashing and counterflashings.

D. Temporary roofing protection.

1.02 RELATED REQUIREMENTS

A. Section 07 51 00 - Built-Up Bituminous Roofing.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Replacement of flashing and counterflashings.

1.03 REFERENCE STANDARDS

A. ASTM D4601/D4601M - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing; 2004 (Reapproved 2020).

B. PS 1 - Structural Plywood; 2009 (Revised 2019).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Attendees:
      a. Contractor.
      b. Owner.

1.05 SUBMITTALS

A. Product Data: Submit for each type of material.

B. Shop Drawings: Indicate size, configuration, and installation details.

C. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.08 FIELD CONDITIONS

A. Existing Roofing System: Built-up asphalt roofing.

B. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.

C. Maintain continuous temporary protection prior to and during installation of new roofing system.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 COMPONENTS

A. See the following sections for additional information on components relating to this work:

2.02 MATERIALS

A. Patching Materials: Provide necessary materials in accordance with requirements of existing roofing system.

B. Temporary Roofing Protection Materials:
   1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.
   2. Plastic Sheeting: Provide polyethylene sheets; use weights to retain sheeting in position.
   3. Plywood Sheathing: PS 1, Grade C-D, Exposure I.

2.03 ACCESSORIES

A. Fasteners: Type and size as required and compatible with existing and new roofing system to resist local wind uplift.

B. Base Sheet: Non-perforated, asphalt-coated glass fiber base sheet, Type II in accordance with ASTM D4601/D4601M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.02 PREPARATION

A. Sweep roof surface clean of loose matter.

B. Remove loose refuse and dispose of properly off-site.

3.03 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials the same day.

B. Remove metal counter flashings.

C. Remove vapor retarder, sheathing paper, underlay, and _____.

D. Repair existing wood deck surface to provide smooth working surface for new roof system.

3.04 INSTALLATION

A. Coordinate scope of this work with requirements for installation of new roofing system, see Section 07 51 00 for additional requirements.

3.05 PROTECTION

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at exterior wall behind scheduled exterior wall finish.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 07 26 00 - Vapor Retarders: Separate vapor retarder materials.

B. Section 07 27 00 - Air Barriers: Separate air barrier materials.

1.03 DEFINITIONS

A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.
   1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also considered a mineral.
   2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
   3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

1.04 REFERENCE STANDARDS

A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

D. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2017.

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

H. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

I. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2018.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.06 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Over Wood Stud Framed Walls, Continuous: Polyisocyanurate board.

B. Insulation in Wood Framed Walls: Batt insulation with integral vapor retarder.

C. Insulation in Wood Framed Ceiling Structure: Batt insulation with integral vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
   1. Classifications:
      a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
         1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
         3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48), minimum, at 75 degrees F.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Water Vapor Permeance: 1.2 perm, maximum, at 1 inch thickness, and when tested in accordance with ASTM E96/E96M, desiccant method.
   5. Board Size: 48 inch by 96 inch.
   6. Board Thickness: 0.75 inch.
   7. Board Edges: Square.
   8. Products:
      a. Atlas Roofing Corporation; ACFoam-II Polyiso Roof Insulation: www.atlasroofing.com/#sle.
      b. Firestone ISO 95+ GL Insulation www.holcimelevate.com
      c. DuPont de Nemours, Inc; Thermax Sheathing: building.dupont.com/#sle.
      d. Johns Manville; AP Foil-Faced: www.jm.com/#sle.
      e. Rmax Inc; ECOMAXci FR: www.rmax.com/#sle.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.
   5. Thermal Resistance: R-value of 20.
   6. Thickness: 5-1/2 inch.
   7. Facing: Aluminum foil, one side.

8. Products:
    a. CertainTeed Corporation: www.certainteed.com/#sle.
    b. Johns Manville: www.jm.com/#sle.
    c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Mineral Wool Blanket Thermal Insulation: Flexible preformed insulation, complying with ASTM C665.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
3. Provide foil facing on one side, at locations indicated on drawings.
4. Thermal Resistance: R-value of 21.
5. Thickness: 5-1/4 inch.
6. Products:
    a. Johns Manville; Mineral Wool TempControl Batts: www.jm.com/#sle.
    b. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
    c. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
    d. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: See Section 07 25 00.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
1. Application: Sealing of interior circular penetrations, such as pipes or cables.
2. Width: Are required for application.
3. Temperature Resistance: Range of minus 40 to 212 degrees F.

C. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

D. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install rigid insulation directly to exterior grade sheathing at 16 inches on center with manufacturer recommended mechanical fasteners, and tape joints with manufacturer's minimum 4 inches wide sealant tape; comply with ASTM E2357.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

G. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

H. Tape seal tears or cuts in vapor retarder.

I. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

J. Coordinate work of this section with requirements for vapor retarder, see Section 07 26 00.

K. Coordinate work of this section with construction of air barrier seal, see Section 07 27 00.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-resistive barriers.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Water-resistive barrier under exterior cladding.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

C. Section 09 24 00 - Cement Plastering (Stucco): Water-resistive barrier under exterior cladding.

1.03 DEFINITIONS

A. Weather Barriers: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Water-Resistive Barrier: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

1.04 REFERENCE STANDARDS

A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

B. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2017 (Reapproved 2021).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

E. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIER MATERIALS

A. Water-Resistive Barrier Coating: Fluid applied, UV-resistant coating for use over various types of exterior sheathing, CMU, and precast concrete in accordance with ICC-ES AC212.
   1. Dry Film Thickness (DFT): ___ mils, ___ inch, minimum.
   2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method.
   3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 120 days of weather exposure.

4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
5. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.
6. Joint Preparation Treatment: As recommended by coating manufacturer.
7. Products:
    a. STO Gold Coat

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories Used for Sealing Water-Resistive Barrier and Adjacent Substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and weather barrier materials.
1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch nominal thickness.
2. Color: Green.
3. Products:
    a. COLPHENE 3000 - WATERPROOFING FOR FOUNDATIONS. FOR CONDITION WHERE FLOOR JOISTS INTERFACE WITH GRADE.

C. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
1. Width: 4 inches.
2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.
3. Products:
    a. DuPont de Nemours, Inc; FlexWrap: www.dupont.com/building/#sle.
    b. Henry Company; FortiFlash: www.henry.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Water-Resistive Barriers: Install continuous water-resistive barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Mechanically Fastened Exterior Sheets:
1. Install sheets shingle-fashion to shed water, with seams aligned horizontal.
2. Overlap seams as recommended by manufacturer, 6 inches, minimum.
3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
4. Install water-resistive barrier over jamb flashings.
5. Install head flashings under water-resistive barrier.
6. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

E. Coatings:
   1. Prepare substrate in accordance with coating manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
   2. Apply flashing to seal with adjacent construction and to bridge joints in coating substrate.

F. Openings and Penetrations in Exterior Water-Resistive Barriers:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto water-resistive barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
   3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
   4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches beyond face of jambs; seal water-resistive barrier to flashing.
   5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Owner’s Inspection and Testing: Cooperate with Owner’s testing agency.
   1. Allow access to work areas and staging.
   2. Notify Owner’s testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
   3. Do not cover work of this section until testing and inspection is accepted.

C. Do not cover installed water-resistive barriers until required inspections have been completed.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 26 00
VAPOR RETARDERS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with vapor retarders.

1.02 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

PART 2 PRODUCTS

2.01 VAPOR RETARDERS

A. Vapor Retarder Sheet: ASTM D1970/D1970M. Vapor retarder to be self adhering sheet vapor retarder to go under the standing seam metal roof.
   1. Type: Rubberized asphalt bonded to thermoplastic sheet, self-adhesive.
   2. Thickness: 30 mil, ___ inch, nominal.
   3. Water Vapor Permeance: .1 perm, maximum, when tested in accordance with ASTM E96/E96M.
   4. Products:
      a. Carlisle Coatings and Waterproofing; Fire Resist 705FR-A: www.carlisleccw.com/#sle.
      b. Carlisle Coatings and Waterproofing; CCW-705 Air and Vapor Barrier Sheet: www.carlisleccw.com/#sle.
      c. Henry Company; Air-Bloc 16MR: www.henry.com/#sle.
      d. W.R. Meadows, Inc; Air-Shield: www.wrmeadows.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.

B. Primer: Liquid applied polymer.
   1. Color: Green.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 27 00
AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air barriers.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Air barrier under exterior cladding.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with air barriers.

C. Section 09 21 16 - Gypsum Board Assemblies: Air barrier under exterior cladding.

1.03 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.04 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

D. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

E. Installer's qualification statement.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

B. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.07 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
   1. Air Barrier Coating:
      a. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

b. Water Vapor Permeance: 11 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.
c. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
d. Products:
    1) Henry Company; Air-Bloc All Weather STPE: www.henry.com/#sle.
    2) Sto Corp; Sto Gold Coat: www.stocorp.com/#sle.
    3) W.R. Meadows, Inc; Air-Shield TMP: www.wrmeadows.com/#sle.
    4) _____.
    5) Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.

B. Flexible Flashing: Self-adhering or mechanically-attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work of this section.

B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Fluid-Applied Coatings or Membranes:
    1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
    2. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.

E. Openings and Penetrations in Exterior Air Barriers:
    1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
    2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
    3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
    4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
    5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.

6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Do not cover installed air barriers until required inspections have been completed.

C. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

3.06 SCHEDULE

A. Air Barrier Sheet- Mechanically Fastened:
   1. Provide at all other exterior walls under exterior finishes.

B. Air Barrier- Fluid Applied:
   1. Apply on exterior face of exterior OSB sheathing under portland cement plaster (stucco) finish system as scheduled on the drawings..

END OF SECTION

SECTION 07 41 13
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal roof panel system of preformed steel panels.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Roof sheathing.

B. Section 07 92 00 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2025.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

F. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2025.

G. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2024).

H. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.
   3. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
   1. Include typical panel joint in sample.

F. Test Reports: Indicate compliance of metal roofing system to specified requirements.

G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 FIELD CONDITIONS

A. Do not install metal roof panels, eave protection membrane or underlayment when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Metal Roof Panel Manufacturers:
   1. Berridge Manufacturing Company; Double-Lock Zee-Lock Panel: www.berridge.com/#sle.
   2. Elevate; Warranted Una-Clad UC- 3 Standing Seam Metal Roofing Panel: www.holcimelevate.com/#sle.
   3. Petersen Aluminum Corporation; Tite-Loc Panel: www.pac-clad.com/#sle.
   4. Morin SWL 16 or SWL-16-2 Standing Seam Metal Roof.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
   1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
   2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
   3. Wind Uplift: Class 90 wind uplift resistance of UL 580.
   4. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646; perform test immediately following air infiltration test.
   5. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.03 METAL ROOF PANELS

A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
      b. Steel Thickness: Minimum 22 Ga.
   2. Profile: Standing seam, with minimum 1-1/2-inch seam height; concealed fastener system for field seaming with special tool.
   3. Texture: Smooth, with intermediate ribs for added stiffness.
   4. Length: Full length of roof slope, without lapped horizontal joints.
   5. Width: Maximum panel coverage of 16 inches.

2.04 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.05 FABRICATION

A. Panels: Provide factory fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

2.06 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.
   1. Products:
      a. Arkema, Inc; Kynar 500: www.arkema.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, preformed crickets, and caps of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: 1 inch high, narrow batten, close-fitting cap of steel with corrosion resistant finish, closed-cell synthetic rubber, neoprene, or PVC, combination steel and closed-cell foam, copper, or prefinished aluminum.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

D. Underlayment for Wood Substrate: ASTM D226/D226M roofing felt, perforated type; covered by water-resistant rosin-sized building paper.

E. Underlayment: Self-adhering polymer modified asphalt sheet complying with ASTM D1970/D1970M, with strippable release film and top surface of woven polypropylene sheet. **Provide a high temperature self adhering roof underlayment.**
   1. Sheet Thickness: 40 mils, 0.040 inch, minimum.
   2. Self Sealability: Nail sealability in accordance with ASTM D1970/D1970M.
   3. Low Temperature Flexibility: Comply with ASTM D1970/D1970M.

4. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M using Desiccant Method (Method A).
5. High Temperature Range
6. Products:
   a. Certainteed Roofing; WinterGuard HT - High Temperature Waterproofing Underlayment: www.certainteed.com/#sle.
   b. Polyglass USA, Inc; Polystick MTS Self-Adhered High Temperature Roof Underlayment: www.polyglass.us/#sle.
   c. Carlisle WIP 300 HT Protection Self Adhering Roofing Unerlayment
   d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.

C. Coordinate installation of waterproof membrane over roof sheathing with Section 06 10 00.

D. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.

E. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.

F. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

G. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.

B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Install roofing felt and building paper slip sheet on roof sheathing before installing preformed metal roof panels; secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners; apply from eaves to ridge in shingle fashion, overlapping horizontal joints at least 2 inches and side and end laps at least 3 inches; offset seams in building paper and seams in roofing felt.

D. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.

1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by panel manufacturer.
2. Provide concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
3. Provide sealant tape or other approved joint sealer at lapped panel joints.
4. Install sealant or sealant tape at end laps and side joints as recommended by metal roof panel manufacturer.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 42 13
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wall panel substrate.

B. Section 07 25 00 - Weather Barriers: Weather barrier under wall panels.

C. Section 07 27 00 - Air Barriers: Air barrier under wall panels.

D. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

D. Samples: Submit two samples of wall panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Testing agency's qualification statement.

H. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Concealed Fasteners:
   1. Basis of Design: Morin Corporation, Matrix Series
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels and Classic individual clip and fastener.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Design Pressure: In accordance with applicable codes.
   4. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   8. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.
   9. Provide continuity of air barrier seal at building enclosure elements in accordance with requirements; see Section 07 27 00.

B. **MP-1:**
   1. Profile: Vertical. MATRIX SERIES, MIX OF PANELS
   2. STYLE TO MATCH A REPEATING PATTERN OF MX-1, MX-2, MX-7 AND MX-10
   3. Side Seams: Double-interlocked, tight-fitting, sealed with continuous bead of sealant.
   4. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
   5. Panel Type: Use 2' wide panels in style MX-1, MX-2, MX-7 and 4' of MX-10 for the elevations as shown. Refer to elevations for locations of certain panels and pattern.
   6. Panel Depth: 1-1/2 inches.
   7. Color: REGAL BLUE.

C. **MP-2:**
   1. Profile: Vertical.MATRIX SERIES, MIX OF PANELS
   2. STYLE TO MATCH A REPEATING PATTERN OF MX-11 AND MX-8
   3. Side Seams: Double-interlocked, tight-fitting, sealed with continuous bead of sealant.
   4. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
   5. Panel Type: Use 2' wide panels in style MX-1, MX-2, MX-7 and 4' of MX-10 for the elevations as shown. Refer to elevations for locations of certain panels and pattern.
   6. Panel Depth: 1-1/2 inches.

7. Color: ANTIQUE BRONZE.

D. **MP-2B:**
1. Profile: Vertical.MX-11
2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous bead of sealant.
3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
4. Panel Type: Use 2' wide panels in style MX-1, MX-2, MX-7 and 4' of MX-10 for the elevations as shown. Refer to elevations for locations of certain panels and pattern.
5. Panel Depth: 1-1/2 inches.
6. Color: ANTIQUE BRONZE

E. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

F. Expansion Joints: Same material, thickness and finish as exterior sheets; manufacturer's standard brake formed type, of profile to suit system.

G. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

H. Anchors: Galvanized steel.

2.03 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard 70% polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

C. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.
1. Products:
a. Arkema, Inc; Kynar 500: www.arkema.com/#sle.
b. PPG; Duranar: www.ppgmetalcoatings.com/#sle.
c. Sherwin-Williams Company; Fluropon: www.coil.sherwin.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

A. Cladding Support Clips: Thermally-broken, thermal spacer clips for support of cladding z-girts, angles, channels, and other framing.
1. Thermal Spacer Clip: Pultruded glass fiber and thermoset polyester resin clip; 3/16 inch thick at top, base, and web.
2. Clip Depth: As indicated on drawings.

B. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

C. For shimming at the existing masonry veneer, utilize adjustable wall clip.
1. BETAFIX ADJUSTABLE CLIP

D. Furring Channels: Hat-shaped; 7/8-inch depth; 18 ga.
1. Products:
a. MBA Building Supplies: MBA Furring Channel; www.mbastuds.com
b. Telling Industries; Furring Channel; www.tellingingindustries.com

c. Substitutions: See Section01 60 00-Product Requirements

E. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 92 00

F. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
1. Products:
a. Franklin International, Inc; Titebond WeatherMaster Metal Roof Sealant: www.titebond.com/#sle.

G. Fasteners: Manufacturer's standard type to suit application; steel, hot dip galvanized.
1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
2. Products:
a. ITW Commercial Construction North America; Teks Select Series: www.ITWBuildex.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

H. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify weather barrier, see Section 07 25 00, has been installed over wall panel substrate; see Section 05 40 00.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane, and spaced at intervals indicated.

B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.03 INSTALLATION

A. install furring channels horizontally to wall substrate.

B. Install panels on walls, vertically in accordance with manufacturer's instructions.

C. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

D. Fasten panels to structural supports; aligned, level, and plumb.

E. Lap panel ends 2 inches, minimum.

F. Use concealed fasteners unless otherwise indicated by Architect.

G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.05 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove site cuttings from finish surfaces.

C. Remove protective material from wall panel surfaces.

D. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.06 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 46 46
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.

B. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2022.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Soffit Panels: Smooth panels of same material and finish.

B. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: Smooth.
   2. Length: 96 inches, nominal.
   3. Width: 48 inches.
   4. Thickness: 5/16 inch, nominal.
   5. Finish: Factory applied topcoat.
   6. Color: Black
   7. Manufacturer: Same as siding.

2.02 ACCESSORIES

A. Support for Cladding and Continuous Insulation: Thermal clips.
   1. Thermally-broken clips that provide attachment support for girts, angles, channels, and other cladding support framing.
   2. Spacing of Clips: 16 inches on center, vertically.
   3. Fasteners: As recommended by clip manufacturer.

B. Trim: Same material and texture as siding.

C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Do not begin until unacceptable conditions have been corrected.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces during execution of this work.

3.03 INSTALLATION

A. Install siding in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
   2. Use trim details as indicated on drawings.
   3. Touch up field cut edges before installing.
   4. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood Studs without Sheathing: Install siding over weather-resistive barrier, fastened into studs.

C. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

D. Do not install siding less than 6 inches from ground surface, or closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

E. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

END OF SECTION

SECTION 07 54 23
THERMOPLASTIC-POLYOLEFIN ROOFING (TPO) - ELEVATE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. TPO membrane roofing system and accessories.

B. Metal accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.

1.03 REFERENCE STANDARDS

A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

B. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2016 (Reapproved 2022).

C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

D. FM (AG) - FM Approval Guide; Current Edition.

E. NRCA (RM) - The NRCA Roofing Manual; 2026.

F. PS 1 - Structural Plywood; 2009 (Revised 2019).

G. PS 20 - American Softwood Lumber Standard; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Where UL or FM requirements are specified, provide documentation showing roofing system is UL classified or FM approved, as applicable; include data-itemizing components of classified or approved system.

C. Shop Drawings: Indicate membrane manufacturer's standard details, drawn to scale and customized for project for relevant conditions.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Preinstallation Notice: Provide copy of manufacturer's approved preinstallation notice.

F. Executed warranty.

1.06 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather-protective covering.

C. Keep combustible materials away from ignition sources.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather or when ambient conditions conflict with manufacturer's installation instructions.

B. Schedule applications so no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Comply with warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

C. System Warranty: Manufacturer's limited warranty covering membrane, roof insulation, and other specified system components for term indicated.
   1. Liability Limit: No dollar limitation.
   2. Scope of Coverage: Repair leaks in roofing system caused by:
      a. Ordinary wear and tear of elements.
      b. Manufacturing defect in Elevate brand materials.
      c. Defective workmanship used to install materials.
      d. Damage due to winds up to 55 mph.
   3. Not Covered:
      a. Damage to winds in excess of specified speed.
      b. Damage due to hurricanes or tornadoes.
      c. Hail.
      d. Intentional damage.
      e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Membrane Roofing System:
   1. Elevate Commercial Building Products: www.elevatecommercialbp.com/#sle.

B. Metal Roof Edging Manufacturer: Same manufacturer as roof membrane.
   1. Field- or shop-fabricated metal roof edgings are unacceptable.

C. Substitutions: Permitted. Submit Substitution Request.

2.02 MEMBRANE ROOFING SYSTEM

A. Description: TPO single-ply membrane.
   1. Comply with applicable local building code requirements.
   2. Provide assembly having Underwriters Laboratories, Inc. (UL) Class B fire hazard classification.

B. Roofing System Components: Listed in order from top of roof down:
   1. Membrane: Thickness as specified.

2.03 MEMBRANE MATERIALS

A. Membrane: Flexible, heat-weldable sheet composed of TPO polymer and ethylene propylene rubber; complying with ASTM D6878/D6878M, with polyester weft-inserted reinforcement and the following additional characteristics:
   1. Solar Reflectance: 0.79, minimum, when tested in accordance with ASTM C1549.
   2. Color: White.
   3. Products:
      a. Elevate Commercial Building Products; UltraPly TPO.

B. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge eliminating need for seam sealing flashing-to-roof splice; precut to 18 inches wide.

C. Formable Flashing: Nonreinforced, flexible, heat-weldable sheet, composed of TPO polymer and ethylene propylene rubber.
   1. Thickness: 0.06 inch plus/minus 10 percent.

2. Product: Elevate Commercial Building Products; UltraPly TPO Flashing.

D. Pourable Sealer: Manufacturer's recommended two-part polyurethane, two-color for reliable mixing.

E. Cut Edge Sealant: Use manufacturer's recommended sealant for exposed membrane reinforcement.

F. General Purpose Sealant: Manufacturer's recommended, one part, white.

G. Molded Flashing Accessories: Unreinforced TPO membrane premolded to suit variety of flashing details, including pipe boots, inside corners, outside corners, etc.
1. Product: Elevate Commercial Building Products; UltraPly TPO Small and Large Pipe Flashing.

H. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.1 inch thick.
1. Product: Elevate Commercial Building Products; Termination Bar.

2.04 METAL ACCESSORIES

A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
1. Wind Performance:
a. Membrane Pull-Off Resistance: 100 lb/ft, minimum, when tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-1.
b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-2.
c. Provide product listed in FM (AG) with at least FM 1-270 rating.
2. Fascia Face Height: Per Drawings
3. Length: 144 inches.
4. Anchor Bar Cleat: 20-gauge, 0.036-inch galvanized steel with prepunched holes.
5. Fasteners: Factory-provided corrosion-resistant fasteners, with drivers; do not permit exposed fasteners.

2.05 ACCESSORIES

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
1. Do not use asphaltic or creosote-treated lumber.
2. Do not use lumber treated with wood preservatives, such as pentachlorophenol, copper naphthenate, or copper 8-quinolinolate.
3. Width: 3-1/2 inches, nominal minimum, or as wide as nailing flange of roof accessory attached.
4. Thickness: Same as thickness of roof insulation.

PART 3 EXECUTION

3.01 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for specified roofing system. Where manufacturer provides no instructions or recommendations, follow NRCA (RM) written requirements and industry standards. Comply with federal, state, and local regulations.

B. Obtain relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until preinstallation notice has been submitted to manufacturer.

D. Provide temporary closures to ensure moisture does not damage completed roofing. Use flashings, terminations, and temporary closures to provide watertight installation.

E. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants, and coatings.
   2. Protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within range of windborne overspray.
   3. Protect finished areas of roofing system from roofing-related work traffic and traffic by other trades.

3.02 EXAMINATION

A. Examine roof deck to determine deck is sufficiently rigid to support installers and mechanical equipment so deflection will not strain or rupture roof components or deform deck.

B. Verify surfaces and site conditions are ready to receive work. Correct defects in substrate before commencing with roofing work.

C. Examine roof substrate to verify adequate slope to drains.

D. Verify specifications and drawing details are workable and not in conflict with roofing manufacturer's recommendations and instructions; start of work constitutes acceptable project conditions and requirements.

3.03 PREPARATION

A. Take appropriate measures to ensure fumes from adhesive solvents are not drawn into building through air intakes.

B. Before proceeding, ensure roof surface is clean, dry, and smooth and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease, and other materials that may damage membrane.

C. Fill surface voids in immediate substrate greater than 1/4-inch wide with fill material acceptable insulation to membrane manufacturer.

3.04 WOOD DECK PREPARATION

A. Verify wood decking edges are supported and deck surfaces are flat. Fill and treat knot holes with latex filler.

3.05 COVER BOARD INSTALLATION

A. Install in accordance with membrane manufacturer's instructions and recommendations.

B. Mechanical Fastening: Using manufacturer's recommended fasteners, install in pattern required by membrane manufacturer.

3.06 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax before attachment or splicing. Refer to membrane manufacturer's guidelines for minimum relaxation time.

B. Lay out membrane pieces so field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Edge Securement: Secure membrane at locations where membrane terminates or goes through angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches wide.

3.07 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover metal flange, install additional piece of flashing to cover metal edge.
   6. If roof edge includes gravel stop and sealant is not applied between laps in metal edging, install additional piece of self-adhesive flashing membrane over metal lap to top of gravel stop; apply seam edge treatment at intersections of two flashing sections.
   7. When roof slope is greater than 1:12, apply seam edge treatment along back edge of flashing.

C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces.
   1. Extend flashing minimum 8 inches above membrane surface unless otherwise shown.
   2. Use longest practical flashing pieces.
   3. Evaluate substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   4. Complete splices between flashing and main roof sheet with specified splice adhesive before adhering flashing to vertical surfaces.

D. Flashing at Penetrations: Flash penetrations passing through membrane; make flashing seals directly to penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified premolded pipe flashings wherever practical; otherwise, use specified self-curing elastomeric flashing.
   2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches deep, with at least 1-inch clearance from penetration; fill with manufacturer's pourable sealer, and slope to shed water.
   3. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide standard curb with flashing.
   4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.

3.08 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

C. Repair or replace building components and finished surfaces damaged or defaced due to work of this section; comply with recommendations of manufacturers of components and surfaces.

D. Remove leftover materials, trash, debris, and equipment from project site and surrounding areas.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, exterior penetrations, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

C. Precast concrete splash pads.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement; 2025.

F. CDA A4050 - Copper in Architecture - Handbook; Current Edition.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples, 2 by 4 inches in size, illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.

1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

2. Color: As selected by Architect from manufacturer's standard colors.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 GUTTERS AND DOWNSPOUTS

A. Gutters: SMACNA (ASMM) Rectangular profile.

B. Downspouts: Rectangular profile; open-face.

C. Gutters and Downspouts: Size indicated.

D. Accessories: Profiled to suit gutters and downspouts.
   1. Gutter Supports: Brackets.
   2. Downspout Supports: Brackets.

E. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3,000 psi at 28 days, with minimum 5 percent air entrainment.

F. Seal metal joints.

2.04 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.

C. Primer Type: Zinc chromate.

D. Concealed Sealants: Non-curing butyl sealant.

E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

G. Reglets: Surface-mounted type, galvanized steel; face and ends covered with plastic tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Secure gutters and downspouts in place with concealed fasteners.

F. Slope gutters 1/4 inch per 10 feet, minimum.

G. Set splash pads under downspouts.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE

A. Through-Wall Flashing in Masonry:

B. Gutters and Downspouts:

C. Coping, Cap, Parapet, Sill and Ledge Flashings:

D. Counterflashings at Curb-Mounted Roof Items:

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

B. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2017).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Substrates for which laboratory adhesion and/or compatibility testing is required.
7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
8. Sample product warranty.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Executed warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
1. Adfast USA Inc: www.adfastcorp.com/#sle.
2. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
3. Bostik Inc: www.bostik-us.com/#sle.
4. Dow: www.dow.com/#sle.
5. Franklin International, Inc: www.titebond.com/#sle.
6. Henry Company: www.henry.com/#sle.
7. Hilti, Inc: www.hilti.com/#sle.
8. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
9. Pecora Corporation: www.pecora.com/#sle.
10. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
11. Sika Corporation: www.usa.sika.com/#sle.
12. Specified Technologies Inc: www.stifirestop.com/#sle.
13. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
14. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
15. Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Leveling Sealants:
1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
2. Bostik Inc: www.bostik-us.com/#sle.
3. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
4. Dow: www.dow.com/#sle.
5. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
6. Pecora Corporation: www.pecora.com/#sle.
7. QUIKRETE Companies: www.quikrete.com/#sle.
8. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
9. Sika Corporation: www.usa.sika.com/#sle.
10. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
11. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
12. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
   a. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.

c. Joints between different exposed materials.
d. Openings below ledge angles in masonry.
e. Other joints indicated below.

2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
      1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings. See Section 09 21 16 for additional information.
      2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated.
   c. Other joints indicated below.
3. Do not seal the following types of joints:
   a. Intentional weep holes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Type A - Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.

C. Type D - Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.

D. Type E - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

E. Interior Wet Areas: Bathrooms, restrooms, and kitchens; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

F. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.04 NONSAG JOINT SEALANTS

A. Type A - Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   5. Color: To be selected by Architect from manufacturer's standard range.
   6. Service Temperature Range: Minus 20 to 180 degrees F.
   7. Products:
      a. Dow; DOWSIL 756 SMS Building Sealant: www.dow.com/#sle.
      b. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
      c. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: www.dow.com/#sle.
      d. Dow; DOWSIL 795 Silicone Building Sealant: www.dow.com/#sle.
      e. Pecora Corporation; Pecora 890 NST (Non-Staining Technology): www.pecora.com/#sle.
      f. Sika Corporation; Sikasil WS-290: www.usa.sika.com/#sle.

g. Sika Corporation; Sikasil WS-295: www.usa.sika.com/#sle.
h. Sika Corporation; Sikasil 728NS: www.usa.sika.com/#sle.
i. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.
j. Tremco Commercial Sealants & Waterproofing; Spectrem 3: www.tremcosealants.com/#sle.
k. Substitutions: See Section 01 60 00 - Product Requirements.

B. Type B - Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
3. Cure Type: Single component, neutral moisture curing.
4. Service Temperature Range: Minus 65 to 180 degrees F.
5. Products:
a. Pecora Corporation; Pecora 860: www.pecora.com/#sle.
b. Pecora Corporation; Pecora 890FTS (Field Tintable Smooth): www.pecora.com/#sle.
c. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
d. Sika Corporation; Sikasil WS-295: www.usa.sika.com/#sle.
e. Sika Corporation; Sikasil N-Plus US: www.usa.sika.com/#sle.
f. Substitutions: See Section 01 60 00 - Product Requirements.

C. Type C - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.
2. Products:
a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
b. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Type D - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Products:
a. Pecora Corporation; DynaTrol II: www.pecora.com/#sle.
b. Pecora Corporation; DynaFlex: www.pecora.com/#sle.
c. Sika Corporation; Sikaflex-1a: www.usa.sika.com/#sle.
d. Sika Corporation; Sikaflex-15 LM: www.usa.sika.com/#sle.
e. Sika Corporation; Sikaflex-2c NS: www.usa.sika.com/#sle.
f. Tremco Commercial Sealants & Waterproofing; Dymonic 100: www.tremcosealants.com/#sle.
g. Tremco Commercial Sealants & Waterproofing; Dymeric 240 FC: www.tremcosealants.com/#sle.
h. Tremco Commercial Sealants & Waterproofing; Vulkem 116: www.tremcosealants.com/#sle.
i. Substitutions: See Section 01 60 00 - Product Requirements.

E. Type E - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
3. Products:

a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
b. Hilti, Inc; CP 572 Smoke and Acoustical Spray Sealant: www.us.hilti.com/#sle.
c. Pecora Corporation; AC-20 +Silicone: www.pecora.com/#sle.
d. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
e. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant: www.stifirestop.com/#sle.
f. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.

2.05 SELF-LEVELING JOINT SEALANTS

A. Type F - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: Gray.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Products:
a. Pecora Corporation: www.pecora.com/#sle.
b. Sherwin-Williams Company; Stampede 2SL Polyurethane Sealant: www.sherwin-williams.com/#sle.
c. Sika Corporation; Sikaflex-1c SL: www.usa.sika.com/#sle.
d. Sika Corporation; Sikaflex-2c SL: www.usa.sika.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
3. Open Cell: 40 to 50 percent larger in diameter than joint width.
4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
5. Products:
a. Adfast USA Inc; Adseal BR-2600 Backer Rod: www.adfastcorp.com/#sle.
b. Nomaco, Inc: www.nomaco.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Preformed Extruded Silicone Joint Seal: Pre-cured low-modulus silicone extrusion, in sizes to fit applications indicated on drawings, combined with a neutral-curing liquid silicone sealant for bonding joint seal to substrates.
1. Size: 1 inch wide, in rolls 100 feet long.
2. Thickness: 0.78 inch, with ridges along outside bottom edges for bonding area.
3. Color: As selected by Architect..
4. Products:
a. Tremco Commercial Sealants & Waterproofing; Spectrem Simple Seal: www.tremcosealants.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

D. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

E. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

F. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 91 13 - Exterior Painting: Field painting.

D. Section 09 91 23 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NAAMM: National Association of Architectural Metal Manufacturers.

D. NFPA: National Fire Protection Association.

E. SDI: Steel Door Institute.

F. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2018.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

J. ASTM C476 - Standard Specification for Grout for Masonry; 2022.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

L. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
N. ITS (DIR) - Directory of Listed Products; Current Edition.
O. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
P. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
Q. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.
R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
U. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2019.
V. UL (DIR) - Online Certifications Directory; Current Edition.
W. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
C. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
    1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
    2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
    3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
    4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
    5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Type A , Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 3 - Stile and Rail.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Polystyrene, 1 lbs/cu ft minimum density.
      a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
   3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
   4. Door Thickness: 1-3/4 inches, nominal.
   5. Weatherstripping: Refer to Section 08 71 00.

C. Type B , Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.

3. Door Thickness: 1-3/4 inches, nominal.

D. Type C , Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
a. Level 2 - Heavy-duty.
b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
c. Model 1 - Full Flush.
d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
a. Attach fire rating label to each fire rated unit.
4. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
5. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Full profile/continuously welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
3. Weatherstripping: Separate, see Section 08 71 00.

D. Interior Door Frames, Non-Fire Rated: Face welded type.
1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.

E. Door Frames, Fire-Rated: Face welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Mullions for Pairs of Doors: Fixed, with profile similar to jambs.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Transom Bars: Fixed, of profile same as jamb and head.

J. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

K. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
1. Fire-Rated Frames: Comply with fire rating requirements indicated.

2.06 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.

1. Size: As indicated on drawings.
2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
3. Glazing: 1/4 inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

B. Glazing: As specified in Section 08 80 00, factory installed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals for Double Doors: Specified in Section 08 71 00.

E. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
1. Manufacturers:
a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series: www.ITWBuildex.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

G. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Install door hardware as specified in Section 08 71 00.
1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

F. Comply with glazing installation requirements of Section 08 80 00.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 71 00 - Door Hardware.

C. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 8 by 10 inches in size illustrating wood grain, stain color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special installation instructions.

F. Specimen warranty.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.

1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. VT Industries, Inc; Heritage: www.vtindustries.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Standard Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
   3. Wood veneer facing with factory transparent finish.COLOR TO BE SELECT WHITE MAPLE, CLEAR CL18

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White Maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Any option allowed by quality standard for grade.
   2. "Running Match" each pair of doors and doors in close proximity to each other.
   3. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.

D. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

G. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Satin.

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 11 13.

B. Metal Louvers:
   1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.

C. Glazing: See Section 08 80 00.

D. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

E. Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE

A. See Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Mortise cylinder and core hardware.

1.03 REFERENCE STANDARDS

A. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Manufacturer's Installation Instructions: Indicate installation requirements.

D. Project Record Documents: Record actual locations of each access unit.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Location: As indicated on drawings.
   2. Panel Material: Steel.
   3. Size: 12 by 12 inches, minimum or as required.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Ceiling-Mounted Units:
   1. Location: As indicated on drawings.
   2. Panel Material: Steel.
   3. Size - Other Ceilings: 12 by 12 inches; minimum or as required.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
      a. Multipurpose Access Panel: Activar/JL Industries TM.
   2. ACUDOR Products Inc: www.acudor.com/#sle.
      a. Wall- and Ceiling-Mounted Units: ACUDOR DW-5058.

3. Babcock-Davis: www.babcockdavis.com/#sle.
4. Cendrex, Inc: www.cendrex.com/#sle.
5. Karp Associates, Inc: www.karpinc.com/#sle.
6. MIFAB, Inc; UA Series: www.mifab.com/#sle.
7. Nystrom, Inc; Architectural Access Door: www.nystrom.com/#sle.
8. Milcor Commercial Products Group; M- Flush Access Door, DW Access Door: www.commercialproductsgroup.com.
9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
1. Style: Exposed frame with door surface flush with frame surface.
a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
2. Door Style: Single thickness with rolled or turned in edges.
3. Frames: 16-gauge, 0.0598-inch minimum thickness.
4. Heavy-Duty Frames: 14-gauge, 0.0747-inch minimum thickness.
5. Single Steel Sheet Door Panels: 16-gauge, 0,0625-inch minimum thickness.
6. Insulation: Non-combustible mineral wool or glass fiber.
7. Steel Finish: Primed.
8. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
9. Door/Panel Size: As indicated on the drawings.
10. Hardware:
a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
b. Latch/Lock: Screw driver slot for quarter turn cam latch.
c. Latch/Lock: Provide cylinder lock-operated cam latch, two keys for each unit; for access panels located in public accessible areas.
1) Mortise cylinder and core as specified in Section 08 71 00.
d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
e. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.
f. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 32 23
SLIDING AND FOLDING GLAZED WALLS AND DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sliding and folding glazed doors and walls.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Steel lintels.

B. Section 06 10 00 - Rough Carpentry: Rough opening framing.

C. Section 07 21 00 - Thermal Insulation: Fibrous stuffing insulation at frame perimeter.

D. Section 07 92 00 - Joint Sealants: Sealing joints between door frames and adjacent construction.

E. Section 08 71 00 - Door Hardware: Additional hardware.

1.03 REFERENCE STANDARDS

A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2024).

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

C. 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).

D. ASTM E413 - Classification for Rating Sound Insulation; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide information on dimensions, frame and sill construction, glazing, and hardware.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, and framed opening tolerances.

D. Samples: Submit two samples, 12 by 12 inch in size illustrating typical frame corner construction, accessories, and finishes.

E. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in installation of products of type specified, with not less than three years of documented experience.

1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site and store in manufacturer's protective cartons until openings are ready for installation.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.
   1. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - ALUMINUM BI FOLD DOOR

A. Floor Mounted; Tested for Air, Water, and Wind Load Performance; Thermally Broken, with Insulating Glazing:
   1. Basis of Design: ARCADIA 10000 SERIES, THERMALLY BROKEN TOP HUNG BI FOLD DOOR

B. Other Manufacturers: Provide either product identified as "Basis of Design" or an equivalent product of another manufacturer.
   1. Arcadia, Inc: www.arcadiainc.com/#sle.
   2. DORMA USA, Inc; _____: www.dorma.com/#sle.
   3. Modernfold, a DORMA Group Company: www.modernfold.com/#sle.
   4. NanaWall Systems, Inc; _____: www.nanawall.com/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 PERFORMANCE REQUIREMENTS

A. Performance Requirements: For units mounted in exterior walls and that require weather performance, provide systems that comply with the following:
   1. Water Penetration Resistance; Static Pressure: No uncontrolled water entry on interior face when tested in accordance with ASTM E331 at differential pressure of 5.25 lbf/sq ft.

B. Acoustical Performance: Provide glass partitions and door assemblies tested by qualified testing agency, calculated in accordance with ASTM E413, tested in accordance with ASTM E90, and rated for not less than Sound Transmission Class (STC) indicated.

2.03 DESIGN CRITERIA - EXTERIOR SYSTEMS

2.04 FACTORY ASSEMBLY

A. Factory assemble sliding/folding operable panel frames as single unit, including head, jambs, and bottom sections; provide concealed fasteners.
   1. Sizes: Allow for tolerances of rough framed openings, clearances, and shims at perimeter of assemblies.
   2. Joints and Corners: Flush, hairline and waterproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   3. Glazing: Factory installed.

2.05 ACCESSORIES

A. Anchors: Hot-dipped galvanized or stainless steel in accordance with project and manufacturer's installation requirements.

B. Sealant for Setting Sills and End Dams: Elastomeric sealant acceptable to door manufacturer.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on approved shop drawings.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit in coordination with air and vapor seal.

3.03 INSTALLATION

A. Install assemblies in accordance with manufacturer's instructions.

B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Use anchorage devices to securely fasten assembly to adjacent construction without distortion or imposed stresses.

D. Set exterior sills in full bed of sealant, with end dams and non-blocking sill drainage openings.

E. Provide sealed end dams at exterior wall locations.

F. Install perimeter trim and interior closures.

3.04 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation from Plumb: 1/16 inch.

C. Maximum Variation from Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 feet straight edge.

3.05 ADJUSTING

A. Adjust hardware for smooth operation.

3.06 CLEANING

A. Remove protective material from factory finished surfaces.

B. Remove labels and visible markings.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 33 13
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Rough openings.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 09 21 16 - Gypsum Board Assemblies: Rough openings.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Samples: Two slats, 4 inches long, illustrating shape, color, and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

G. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for counterbalance shaft assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. C.H.I. Overhead Doors; Model 6522 (steel): www.chiohd.com/#sle.
   2. Overhead Door Corporation: www.overheaddoor.com/#sle.
   3. Raynor Garage Doors: www.raynor.com/#sle.
   4. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Metal Doors, Non-Fire-Rated: Galvanized steel slat curtain.
   1. Mounting: Between jambs, within prepared opening.
   2. Nominal Slat Size: 1-1/4 inches wide.
   3. Slat Profile: Flat.
   4. Finish, Galvanized Steel: Factory powder coated.
   5. Guides: Formed track; same material and finish unless otherwise indicated.
   6. Manual push up operation.
   7. Locking Devices: Latching Mechanism

2.03 COMPONENTS

A. Metal Curtain Construction: Interlocking, single-thickness slats.
   1. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with tube to provide reinforcement and positive contact in closed position.
   3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 22 gauge, 0.03 inch.

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Guides for Galvanized Curtains: ASTM A36/A36M steel angles, size as indicated, _____.
   2. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

D. Lock Hardware:
   1. Latching Mechanism: Inside mounted, adjustable keeper, spring activated latch bar feature to keep in locked or retracted position.

E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that door opening is plumb, header is level, and dimensions are correct.

C. Notify Architect of any unacceptable conditions or varying dimensions.

D. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Infill panels of glass.

C. Aluminum doors and frames.

D. Weatherstripping.

E. Door hardware.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Sealing framing to water-resistive barrier installed on adjacent construction.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 08 51 13 - Aluminum Windows: Operable sash within glazing system.

D. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

E. Section 08 80 00 - Glazing: Glass and glazing accessories.

F. Section 12 24 00 - Window Shades: Attachments to framing members.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM 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.

H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

I. 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).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

G. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least 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. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts:
   1. Arcadia, Inc; _____: www.arcadiainc.com/#sle.
   2. Kawneer North America: www.kawneer.com/#sle.
   3. Manko Window Systems, Inc; _____: www.mankowindows.com/#sle.
   4. Tubelite, Inc: www.tubeliteinc.com/#sle.
   5. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer North America; TriFab VersaGlaze 451/ 451T: www.kawneer.com/#sle.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

2.03 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

A. Center-Set Style:

1. Basis of Design: Kawneer North America; TriFab VersaGlaze 450: www.kawneer.com/#sle..
2. Vertical Mullion Dimensions: 1-3/4 inches wide by 4-1/2 inches deep.

2.04 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer North America; 500 Wide Stile: www.kawneer.com/#sle..
   2. Thickness: 1-3/4 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Tubelite, Inc<>: www.tubeliteinc.com/#sle.
   2. YKK AP America, Inc[<>]: www.ykkap.com/commercial/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.05 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch insulating glazing.
   2. Glazing Rabbet: For 1/4 inch monolithic glazing; interior locations.
   3. Finish: Class I natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   10. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
   3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 6.27 psf pressure difference.

2.06 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.

B. Glazing: See Section 08 80 00.
   1. For Exterior Framing: Type IG-1 or IG-2 as scheduled.
   2. For Interior Framing: Type G-1 or G-2 as scheduled.

C. Swing Doors: Glazed aluminum.
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 4 inches wide.
   3. Vertical Stiles: 4-1/2 inches wide.
   4. Bottom Rail: 10 inches wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

D. Operable Sash: Aluminum project-out awning; finished to match storefront; turn handle latch with manufacturer's standard insect screen.

2.07 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Fasteners: Stainless steel.

D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.

E. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch minimum thickness.

F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

G. Sealant for Setting Thresholds: Non-curing butyl type.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: See Section 08 80 00.

J. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

2.08 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Color: Black

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.09 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: See Section 08 71 00.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install operating sash.

J. Set thresholds in bed of sealant and secure.

K. Install glass using glazing method required to achieve performance criteria; see Section 08 80 00.

L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 01 40 00 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage

C. Related Sections:

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Aluminum-Framed Entrances and Storefronts"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.

b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
c. Indicate complete designations of each item required for each opening, include:
    1) Door Index: door number, heading number, and Architect's hardware set number.
    2) Quantity, type, style, function, size, and finish of each hardware item.
    3) Name and manufacturer of each item.
    4) Fastenings and other pertinent information.
    5) Location of each hardware set cross-referenced to indications on Drawings.
    6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    7) Mounting locations for hardware.
    8) Door and frame sizes and materials.
    9) Degree of door swing and handing.
    10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule and Key Control:
    a. Provide a meeting with Owner, Architect and Contractor to revie key protocol. Provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled. Use SUIT keyway system manufactured by Assa Abloy.
    b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means of Contractor.
    f. Cores shall be purchased and installed by GC. The Tribe (owner) owns a keyway standard to an older core. All cores must be approved by Property and Facilities and the Lock Smith must ensure that the core is compatible with the Tribes key core before purchasing. Keys can only be purchased from SUIT Property and Facilities.
        1) Acceptable Lock Smith vendor/contractor:
            a) Bob’s Lock and Key of Durango

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Final approved hardware schedule edited to reflect conditions as installed.
    d. Final keying schedule

e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

B. Certifications:

1. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

2. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Locks - Schlage ND Series: 10 years
        2) Exit Devices - Von Duprin: 10 years
        3) Closers -LCN 4000 Series: 30 years
        4) Automatic Operators -LCN/DORMA: 2 years
    b. Electrical Warranty – Locks - Schlage: 3 years
        1) Exit Devices -Von Duprin: 3 years

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Substitutions are not allowed unless approved by the Owner. Contractor to provide a substitution request in accordance with section 01 25 00.

B. ALL CORES MUST BE ASSA ABLOY COMPLIANT

C. Acceptable Manufacturers:
   a. IVES
   b. McKinney
   c. Hager, Stanley
   d. Best
   e. Assa Abloy
   f. Schlage
   g. Yale

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

2. Acceptable Manufacturers and Products:
   a. Hager BB1191/1279 series
   b. McKinney TB series
   c. Best FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with power transfer through the hinge, NOT EPT.

2.04 CONTINUOUS HINGES

A. Continuous Hinges are not allowed.

2.05 FLUSH BOLTS AND MORTISE MULTI FUNCTION LOCKS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Best mortise 40/45 14R
   b. Sargent 8200 LP
   c. SUIT approved Equal

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.06 CYLINDRICAL LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Best 9k HD
   b. Sargent 10-Line LP
   c. Or SUIT approved equal

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
   a. Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
   b. Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
   c. Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.
   d. Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
   e. Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.
3. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
5. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
8. Provide electrified options as scheduled in the hardware sets.
9. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
   a. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
   b. Lever Design: Latitude or approved equal by Architect.

2.07 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98/99 series
   b. Sargent 80

B. Requirements:

1. No concealed vertical rods or mortise exit devices allowed.
2. No substitutions or approved equal only on exit devices.
3. 1.0 amp inrush maximum with non-proprietary power supply.
4. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
5. Cylinders: Refer to "KEYING" article, herein.
6. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
7. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
8. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
9. Provide exit devices at exterior gates with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
10. Provide flush end caps for exit devices.
11. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
12. Provide exit devices with manufacturers' approved strikes.
13. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
14. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
15. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
16. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
17. Provide electrified options as scheduled.
18. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
19. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
20. Special Options:
    a. SI
        1) Provide dogging indicators for visible indication of dogging status.
    b. XP
        1) Rim Exit Devices: provide devices with non-tapered smart latchbolt with 90° latchbolt to strike engagement under stress and Static Load Resistance of 2000 pounds.
    c. QM
        1) Rim Exit Devices: provide devices with damper-controlled re-latching to reduce operational noise. Where lever trim is specified, provide damper controlled lever return.
    d. HH
        1) Provide wind and impact rated hurricane exit devices and mullions certified to comply with Florida Building Code (FBC) TAS 201, 202, 203.
    e. HW
        1) Provide wind rated hurricane exit devices and mullions certified to comply with ANSI-ASTM E330.
    f. CX
        1) Provide delayed egress devices, where scheduled, that are UL 294 listed, meet National Fire Protection Association (NFPA) and International Building Code (IBC) governing delayed egress, and/or other local and national fire codes acceptable to authority having jurisdiction as required.

a) Provide non-handed and field sizable device with 3/4 (19mm) throw deadlocking latch bolt. Device incorporates an internal RX switch that detects attempt to exit from applying less than 15lbs to the push pad, which causes this switch to start an irreversible alarm cycle. Key switch in device is capable of arming, disarming, or resetting the device; and indicator lamp determines status of the device.
b) Provide devices capable of standard 15 second release delay and indefinite release delay as required by code, when tied into fire alarm system will release immediately when an alarm condition exists.
c) Provide devices with all control inputs – door position input, external inhibit input, fire alarm input; auxiliary locking; nuisance alarm and internal horn; and, remote signaling output self-contained in the device assembly.

g. CVC
1) Provide cable-actuated concealed vertical latch system in two-point for non-rated or fire rated wood doors up to a 90 minute rating and less bottom latch (LBL) configuration for non-rated or fire rated wood doors up to 20 minute rating. Vertical rods are not permitted.
a) Cable: Stainless steel with abrasive resistant coating. Conduit and core wire ends snap into latch and center slides without use of tools.
b) Wood Door Prep: Maximum 1 inch x 1.1875 inch x 3.875 inches top latch pocket and 1 inch x 1.1875 inch x 5 inches bottom latch pocket which does not require the use of a metal wrap or edge for non-rated or fire rated wood doors up to a 45 minute rating.
c) Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper- infiltrated steel, with molybdenum disulfide low friction coating.
d) Top Latchbolt: Minimum 0.38 inch (10 mm) and greater than 90-degree engagement with strike to prevent door and frame separation under high static load.
e) Bottom Latchbolt: Minimum of 0.44-inch (11 mm) engagement with strike.
f) Product Cycle Life: 1,000,000 cycles.
g) Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
h) Latch release does not require separate trigger mechanism.
i) Cable and latching system characteristics:
i. Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
ii. Connected to exit device at single point in steel and aluminum doors, and two points for top and bottom latches in wood doors.
iii. Bottom latch height adjusted, from single point for steel and aluminum doors and two points for wood doors, after system is installed and connected to exit device, while door is hanging
iv. Bottom latch position altered up and down minimum of 2 inches (51 mm) in steel and aluminum doors without additional adjustment. Bottom latch deadlocks in every adjustment position in wood doors.
v. Top and bottom latches in steel and aluminum doors and top latch in wood doors may be removed while door is hanging.

2.08 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
a. Von Duprin 98/35A Series Outdoor Defense

B. Requirements:

1. Exit device must be designed to perform in outdoor conditions, and engineered to safeguard against moisture, temperature variations, and corrosion.
2. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
3. Provide Outdoor Defense exit devices for use in full exterior application, highly corrosive areas, and where noted in hardware sets.
4. Provide Outdoor Defense exit devices in Rim, Surface Vertical Rod, and Concealed Vertical Rod configuration.
5. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware[LE1] .
6. Cylinders: Refer to “KEYING” article, herein.
7. Provide smooth or touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
8. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
9. Provide exit devices with dead-latching feature for security and for future addition of alarm kits and/or other electrified requirements.
10. Provide flush end caps for exit devices.
11. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
12. Provide exit devices with manufacturers’ approved strikes.
13. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
14. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
15. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
16. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
17. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

C. Outdoor Defense Features:

1. Designed to perform in a variety of outdoor conditions and utilize a series of tests to ensure performance as intended in outdoor applications.
   a. Temperature range: -31 degrees Fahrenheit (-35 degrees Celsius) to 151 degrees Fahrenheit (66 degrees Celsius).
      1) Evaluated per UL294 Section 81 Variable Ambient Test
      2) Evaluated per UL1034 Section 34.2 Variable Ambient Test
   b. Moisture Resistance: Rain tested at 4.8 gallons per minute
      1) Per UL294 Section 79
      2) Per UL1034 Section 53
   c. Corrosion Resistance: Salt Fog Tested per
      1) UL294 Section 83.2 Salt Spray (5% salt concentration)
      2) UL1034 Section 52 Salt Spray Corrosion Test (20% salt concentration)
   d. Dust Resistance: Dust Tested per
      1) UL294 Section 80 Dust Test
      2) UL1034 Section 54 Dust Test

D. Electrified Options (provide as scheduled):

1. Electrified options must be engineered to perform in outdoor conditions and must be warrantied for humidity, rain, and temperature.
   a. CX: Provide delayed egress devices, where scheduled, that are UL 294 listed, meet National Fire Protection Association (NFPA) and International Building Code (IBC) governing delayed egress, and/or other local and national fire codes acceptable to authority having jurisdiction as required.
      1) Provide non-handed and field sizable device with 3/4 (19mm) throw deadlocking latch bolt. Device incorporates an internal RX switch that detects attempt to exit from applying less than 15lbs to the push pad, which causes this switch to start an irreversible alarm cycle. Key switch in device is capable of arming, disarming, or resetting the device; and indicator lamp determines status of the device
      2) Provide devices capable of standard 15 second release delay and indefinite release delay as required by code, when tied into fire alarm system will release immediately when an alarm condition exists.
      3) Provide devices with all control inputs – door position input, external inhibit input, fire alarm input; auxiliary locking; nuisance alarm and internal horn; and, remote signaling output self-contained in the device assembly.
   b. QEL Option, quiet electric latch retraction
   c. ALK Option, alarm kit
   d. LX Option, latch bolt monitoring
   e. RX Option, request to exit switch
   f. WH Option, weep holes

2.09 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:
   a. Precision ELR series
   b. Sargent 3500 series
   c. Dynalock 5000 series
   d. Securitron BPS series
   e. Security Door Controls 600 series
   f. SUIT approved equal

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
   a. 12/24 VDC Output, field selectable.
   b. Class 2 Rated power limited output.
   c. Universal 120-240 VAC input.
   d. Low voltage DC, regulated and filtered.
   e. Polarized connector for distribution boards.
   f. Fused primary input.
   g. AC input and DC output monitoring circuit w/LED indicators.

h. Cover mounted AC Input indication.
i. Tested and certified to meet UL294.
j. NEMA 1 enclosure.
k. Hinged cover w/lock down screws.
l. High voltage protective cover.

2.10 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Assa Abloy – Provide interchangeable cylinders
   b. Match Existing Keyway.
      1) All cores must be Assa Abloy compliant.

B. Requirements:

1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated.

2.11 KEYING

A. Scheduled System:

1. Existing non-factory registered system:
   a. Provide cylinders/cores keyed into Owner's existing keying system managed by Owner's locksmith, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
   b. Acceptable Lock Smith
      1) Bob's Lock and Key Durango:

B. Requirements:

1. Construction Keying:
   a. Temporary Construction Cylinder Keying.
      1) Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
         a) Split Key or Lost Ball Construction Keying System.
         b) 3 construction control keys, and extractor tools or keys as required to void construction keying.
         c) 12 construction change (day) keys.
      2) Owner will void operation of temporary construction keys.
   b. Replaceable Construction Cores.
      1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         a) 3 construction control keys
         b) 12 construction change (day) keys.
      2) Owner will replace temporary construction cores with permanent cores.

2. Permanent Keying:
   a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      1) Master Keying system as directed by the Owner.

b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
c. Provide keys with the following features:
    1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
    2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
d. Identification:
    1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    2) Identification stamping provisions must be approved by the Architect and Owner.
    3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
    5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
e. Quantity: Furnish in the following quantities.
    1) Permanent Control Keys: 3.
    2) Master Keys: 6.
    3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
    4) Key Blanks: Quantity as determined in the keying meeting.

2.12 KEY CONTROL SYSTEM

A. Manufacturers:

1. Use keyway system manufactured by Assa Abloy
    a. The Owner owns a keyway standard to an older core. All cores must be approved by Property and Facilities and the Lock Smith must ensure that the core is compatible with the Tribes key core.

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
    a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
    b. Provide hinged-panel type cabinet for wall mounting.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. LCN 4040XP series

2. Acceptable Manufacturers and Products:
    a. Norton 7700
    b. Sargent 351 series
    c. Stanley

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Closers shall be capable of being upgraded by adding modular mechanical or electronic components in the field.

2.14 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Dorma ED 250 LCN 4600 series

2. Acceptable Manufacturers and Products:
   a. Stanley
   b. SUIT approved equal

B. Requirements:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. Provide drop plates, brackets, and adapters for arms as required for details.
6. Provide actuator switches and receivers for operation as specified.
7. Provide weather-resistant actuators at exterior applications.

8. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.
9. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
10. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. McKinney
   b. Hager, Stanley
   c. Best
   d. Assa Abloy

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. IVES

2. Acceptable Manufacturers:
   a. McKinney
   b. Hager, Stanley
   c. Best
   d. Assa Abloy

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.17 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. IVES

2. Acceptable Manufacturers:
   a. McKinney
   b. Hager, Stanley
   c. Best
   d. Assa Abloy

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other + overhead stop can't be used.

2.18 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. IVES

2. Acceptable Manufacturers:
   a. McKinney
   b. Hager, Stanley
   c. Best
   d. Assa Abloy

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Scheduled Manufacturer:

1. Hager

B. Acceptable Manufacturers:

1. McKinney
2. Hager, Stanley
3. Best
4. Assa Abloy

C. Seals and Gasketing: Provide continuous gasketing on exterior openings, to the head and jambs, forming a continuous seal between the door and the frame. Provide smoke, light, or sound gasketing on interior doors where indicated.

1. Provide self-tapping fasteners for aluminum extruded gasketing being applied to hollow metal frames.
   a. Provide non-corrosive fasteners for all exterior applications.
   b. Provide security fasteners where indicated.

2. Provide neoprene, EPDM, silicone, or nylon brush inserts as specified in hardware sets. Provide non brush inserts of solid or sponge cell, as specified in hardware sets. Vinyl inserts are not allowed except where specified in hardware sets.

D. Smoke Labeled Gasketing: At all smoke labeled openings, provide smoke listed perimeter gasketing assemblies complying with NFPA 105 listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for smoke control ratings indicated based on testing according to UL 1784.

E. Fire Listed Gasketing: Assemblies complying with NFPA 80 that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction for fire ratings indicated based on testing according to UL-10C.

1. Where frame-applied intumescent seals are required by the manufacturer, provide gaskets that comply with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies and UBC 7-2, Fire Tests of Door Assemblies.

F. Sound-Rated Gasketing: Provide acoustic gasketing to meet Sound Transmission Class (STC) rating required.

G. Meeting-Stile Gasketing: Provide meeting-stile gasketing that fastens to the meeting stiles forming a continuous seal when doors are closed.

H. Door Sweeps or Shoes: Apply to the bottom of the door to close the gap between the door bottom and finished floor or saddle threshold.

1. Provide solid neoprene, EPDM, silicone, or nylon brush type of seal as specified in hardware sets. Vinyl inserts are not allowed except where specified in hardware sets.

I. Automatic Door Bottoms:

1. Provide closed cell sponge, bulb neoprene. or EPDM type of seal as specified in hardware sets.
2. Door bottom to be mortised, semi mortised, or surface mount as with a minimum thickness as specified in hardware sets.

J. Rain Drips:

1. Provide overhead rain drips for out-swinging hollow metal doors that are not covered against 45 degree blowing rain. Aluminum extrusion to be a minimum of .088 inches thick and extend 2.50 inches from the face of the frame, in anodized finish to match door.
2. Door sweeps or shoes with integral rain drip must meet ADA requirements

K. Thresholds: Provide threshold units not less than 4 inches wide, formed to accommodate change in floor elevation where indicated, and fabricated to accommodate door hardware and fit door frames.

1. Threshold extrusion to be a minimum thickness as specified in hardware sets.

2.20 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Schlage

2. Acceptable Manufacturers:
   a. SUIT approved equal

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.21 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

P. Thresholds:

1. Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
2. Aluminum thresholds to be cut-in, and scribed around mullions, frame members, and stops. Do not butt to thresholds. Provide a continuous surface across full width of opening from jamb to jamb.
3. Where aluminum panic-type (rabbeted) thresholds with neoprene inserts are specified, undercut doors as required to properly mate with seal in threshold.

Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

R. Perimeter Gasketing: Where Zero International is shown, provide equal from approved manufacturer.

1. Apply to head and jamb, forming seal between door and frame.
2. Install gasketing in a manner eliminating need to cut any seal to install surface mounted hardware. Install compatible mounting bracket for surface mounted hardware unless minimum 1/4 inch thick solid aluminum seals are provided for mounting of surface applied hardware.

S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

T. Door Bottoms/ Sweeps: Apply to bottom of door, forming seal with threshold if door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation. Clean operating items per manufacturer's instructions to restore proper function and finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

Abbreviation	Name
BES	Best Locking Systems
HAG	Hager
IVES	H.B. Ives
LCN	LCN Commercial Division
SCE	Schlage Electronic Security
SCH	Schlage Lock Company
VON	Von Duprin
ZER	Zero International Inc
MCK	Mckinney

DOOR SETS:

Legend:
Link to catalog cut sheet
Electrified Opening

Hardware Set: 05

For use on Door #(s):
105A

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5 NRP			630	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW8			630	IVE
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-CON 24 VDC			626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC			626	
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD			626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	RAIN DRIP	810S			AA	HAG
1	SET	GASKETING	891S			AA	HAG
1	EA	DOOR SWEEP	39A			A	BES
1	EA	THRESHOLD	655A			A	BES
1	EA	WIRE HARNESS	CON-XXP (LENGTH AS REQ'D)				VON
1	EA	FRAME HARNESS	CON-6W				VON
1	EA	CARD READER*	PROVIDED BY DIV 28				
1	EA	DOOR CONTACT	7764 / 679-05 AS REQUIRED			628	SCE
1	EA	POWER / LOW VOTAGE POWER	PROVIDED BY DIV 28				VON

DOOR NORMALY CLOSED AND LOCKED.
ENTRY BY CREDENTIAL READER MONITORED BY ACCESS CONTROL OR BY KEY .
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
EGRESS AT ALL TIMES BY PANIC HARDWARE.

Hardware Set: 06

For use on Door #(s):
103A

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB		689	VON
1	EA	PANIC HARDWARE	98-L-DT-LAT		626	VON
1	EA	PANIC HARDWARE	98-L-LAT		626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC		626	
1	EA	LFIC MORTISE CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC		626	
2	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
2	EA	SURFACE CLOSER	4040XP SHCUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	891S		BK	HAG
1	EA	MULLION SEAL	8780NBK PSA		BK	BES

Hardware Set: 07

For use on Door #(s):
215

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PANIC HARDWARE	98-L-BE-LAT		626	VON
1	EA	SURFACE CLOSER	4040XP HW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	891S		BK	HAG

Hardware Set: 08

For use on Door #(s):
129C

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PANIC HARDWARE	98-L-LAT		626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC		626	
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	SURFACE CLOSER	4040XP HW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	891S		BK	HAG

NOTE: DOOR SWING NEEDS TO CHANGE FROM SWINING INTO ROOM TO OUTSING. (LHR)

Hardware Set: 09

For use on Door #(s):
122

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PANIC HARDWARE	98-L-LAT		626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC		626	
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	891S		BK	HAG

Hardware Set: 10

For use on Door #(s):
116A 116B 117A 121 125A

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND53JD LAT		626	SCH
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	SURFACE CLOSER	4040XP SHCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	891S		BK	HAG

Hardware Set: 11

For use on Door #(s):
109

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND53JD LAT		626	SCH
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	SURFACE CLOSER	4040XP HW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	891S		BK	HAG

Hardware Set: 12

For use on Door #(s):
106 111 118 119 126 201
205B 216

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80JD LAT		626	SCH
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Set: 13

For use on Door #(s):
105B 110 127 208 214A 214B

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80JD LAT		626	SCH
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	OH STOP	7016 SERIES		SP28	HAG
3	EA	SILENCER	SR64		GRY	IVE

Hardware Set: 14

For use on Door #(s):
120

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CONST LATCHING BOLT	FB51P / FB61P AS REQ		US32D	IVE
1	EA	DUST PROOF STRIKE	DP1 / DP2		626	IVE
1	EA	STOREROOM LOCK	ND80JD LAT		626	SCH
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
2	EA	OH STOP	7016 SERIES		SP28	HAG
2	EA	SILENCER	SR64		GRY	IVE

Hardware Set: 15

For use on Door #(s):
107 210 212

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	KEYED PRIVACY LOCK W/ OUTSIDE INDICATOR	ND52JD LAT OS-OCC		626	SCH
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	891S		BK	HAG

Hardware Set: 16

For use on Door #(s):

108 204 205A 206 207 209
213

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND53JD LAT		626	SCH
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	OH STOP	90S		SP28	GLY
1	EA	GASKETING	891S		BK	HAG

Hardware Set: AL-01

For use on Door #(s):
102 129A

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1			US28	IVE
3	EA	HINGE	5BB1			US28	IVE
1	EA	KEYED REMOVABLE MULLION	KR4954 STAB			689	VON
1	EA	PANIC HARDWARE	98-DT			626	VON
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-CON 24 VDC			626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC			626	
1	EA	LFIC MORTISE CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC			626	
2	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD			626	BES
2	EA	SURFACE CLOSER	4040XP SCUSH			689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA			689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30			689	LCN
2	EA	BLADE STOP SPACER	4040XP-61			689	LCN
1	EA	MULLION SEAL	8780NBK PSA			BK	ZER
1	EA	SEALS	BY ALUM DOOR MFG				
2	SET	DOOR SWEEP	BY ALUM DOOR MFG				
1	EA	THRESHOLD	BY ALUM DOOR MFG				
1	EA	WIRE HARNESS	CON-XXP (LENGTH AS REQ'D)				VON
1	EA	FRAME HARNESS	CON-6W				VON
1	EA	CARD READER*	PROVIDED BY DIV 28				
2	EA	DOOR CONTACT	7764 / 679-05 AS REQUIRED			628	SCE
1	EA	POWER / LOW VOTAGE POWER	PROVIDED BY DIV 28				VON

DOOR NORMALY CLOSED AND LOCKED.
ENTRY BY CREDENTIAL READER MONITORED BY ACCESS CONTROL .
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
EGRESS AT ALL TIMES BY PANIC HARDWARE.

Hardware Set: AL-02

For use on Door #(s):
101A

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1		US28	IVE
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-CON 24 VDC		626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC		626	
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	SURF. AUTO OPERATOR	Dorma ED 250 (USE FLUSH CEILING MOUNT)		689	DOR MA
2	EA	ACTUATOR, TOUCH	8310-818T			LCN
2	EA	MOUNT BOX	8310-819F			LCN
1	EA	SEALS	BY ALUM DOOR MFG			
1	SET	DOOR SWEEP	BY ALUM DOOR MFG			
1	EA	THRESHOLD	BY ALUM DOOR MFG			
1	EA	WIRE HARNESS	CON-XXP (LENGTH AS REQ'D)			VON
1	EA	FRAME HARNESS	CON-6W			VON
1	EA	CARD READER*	PROVIDED BY DIV 28			
1	EA	DOOR CONTACT	7764 / 679-05 AS REQUIRED		628	SCE
1	EA	POWER / LOW VOTAGE POWER	PROVIDED BY DIV 28			VON

FREE EGRESS AT ALL TIMES.
OPEN MODE: ACCESS CONTROL SYSTEM TIME CLOCK ELECTRICALLY KEEPS LATCH RETRACTED, ALLOWING ENTRY.
CLOSED MODE: AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY. OUTER ACTUATOR IS DISABLED AFTER HOURS BY ACCESS CONTROL TIME CLOCK. VALID CREDENTIAL AT CARD READER ENABLES OUTER ACTUATOR. INNER ACTUATOR IS ALWAYS ENABLED. IF DOOR IS LATCHED WHEN ENABLED ACTUATOR IS DEPRESSED, OPERATOR RETRACTS LATCHES PRIOR TO OPENING.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

Hardware Set: AL-03

For use on Door #(s):
101B

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1		US28	IVE
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-CON 24 VDC		626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC		626	
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD		626	BES
1	EA	SURF. AUTO OPERATOR	Dorma ED 250 (USE FLUSH CEILING MOUNT)		689	DOR MA
2	EA	ACTUATOR, TOUCH	8310-818T			LCN
2	EA	MOUNT BOX	8310-819F			LCN
1	EA	SEALS	BY ALUM DOOR MFG			
1	EA	WIRE HARNESS	CON-XXP (LENGTH AS REQ'D)			VON
1	EA	FRAME HARNESS	CON-6W			VON
1	EA	CARD READER*	PROVIDED BY DIV 28			
1	EA	DOOR CONTACT	7764 / 679-05 AS REQUIRED		628	SCE
1	EA	POWER / LOW VOTAGE POWER	PROVIDED BY DIV 28			VON

FREE EGRESS AT ALL TIMES.
OPEN MODE: ACCESS CONTROL SYSTEM TIME CLOCK ELECTRICALLY KEEPS LATCH RETRACTED, ALLOWING ENTRY.
CLOSED MODE: AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY. OUTER ACTUATOR IS DISABLED AFTER HOURS BY ACCESS CONTROL TIME CLOCK. VALID CREDENTIAL AT CARD READER ENABLES OUTER ACTUATOR. INNER ACTUATOR IS ALWAYS ENABLED. IF DOOR IS LATCHED WHEN ENABLED ACTUATOR IS DEPRESSED, OPERATOR RETRACTS LATCHES PRIOR TO OPENING.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

Hardware Set: AL-04

For use on Door #(s):
103B

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1			US28	IVE
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-CON 24 VDC			626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC			626	
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD			626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH			689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA			689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30			689	LCN
1	EA	BLADE STOP SPACER	4040XP-61			689	LCN
1	EA	SEALS	BY ALUM DOOR MFG				
1	SET	DOOR SWEEP	BY ALUM DOOR MFG				
1	EA	THRESHOLD	BY ALUM DOOR MFG				
1	EA	WIRE HARNESS	CON-XXP (LENGTH AS REQ'D)				VON
1	EA	FRAME HARNESS	CON-6W				VON
1	EA	CARD READER*	PROVIDED BY DIV 28				
1	EA	DOOR CONTACT	7764 / 679-05 AS REQUIRED			628	SCE
1	EA	POWER / LOW VOTAGE POWER	PROVIDED BY DIV 28				VON

DOOR NORMALY CLOSED AND LOCKED.
ENTRY BY CREDENTIAL READER MONITORED BY ACCESS CONTROL OR BY KEY .
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
EGRESS AT ALL TIMES BY PANIC HARDWARE.

Hardware Set: BI-F100

For use on Door #(s):
103C 103D 116C 117B 125B 129B

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	NOTE	ALL HARDWARE BY BI-FOLD DOOR MFG		

Hardware Set: FH-200

For use on Door #(s):
301 302 303

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	NOTE	ALL HARDWARE BY FLOOR HATCH DOOR MFG		

Hardware Set: G-300

For use on Door #(s):
G-01 and G-04

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	POWER TRANSFER	BY GATE DOOR MFG		
3	EA	Spring Hinge	By Gate Door MFG		
1	EA	ELEC PANIC HARDWARE	OUT-QEL-9827-NL-LBR-CON 24 VDC	626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC	626	
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD	626	BES
1	EA	CARD READER*	PROVIDED BY DIV 28		
1	EA	POWER / LOW VOLTAGE POWER	PROVIDED BY DIV 28		VON

DOOR NORMALY CLOSED AND LOCKED.
ENTRY BY CREDENTIAL READER MONITORED BY ACCESS CONTROL OR BY KEY .
EGRESS AT ALL TIMES BY PANIC HARDWARE.

PROPER PANIC HARDWARE REINFORCEMENTS/PREPS BY GATE DOOR MFG.

NOTE! G-04 (south gate from teen patio) DOES NOT REQUIRE CARD READER OR POWER/LOW VOLTAGE POWER

Hardware Set: G-400

For use on Door #(s):
G-02 and G-03

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	POWER TRANSFER	BY GATE DOOR MFG		↯		
6	EA	Spring Hinge	By Gate Door MFG				
1	EA	PANIC HARDWARE	OUT-9827-EO-LBR	📄		626	VON
1	EA	ELEC PANIC HARDWARE	OUT-QEL-9827-NL-LBR-CON 24 VDC	📄	↯	626	VON
1	EA	LFIC RIM CYLINDER HOUSING	AS REQ'D BY LOCKING MECHANISM SARGENT LFIC			626	
1	EA	LFIC CORE	MATCH EXISTING OWNER STANDARD			626	BES
1	EA	CARD READER*	PROVIDED BY DIV 28		↯		
1	EA	POWER / LOW VOLTAGE POWER	PROVIDED BY DIV 28	📄	↯		VON

DOOR NORMALY CLOSED AND LOCKED.
ENTRY BY CREDENTIAL READER MONITORED BY ACCESS CONTROL OR BY KEY .
EGRESS AT ALL TIMES BY PANIC HARDWARE.

PROPER PANIC HARDWARE REINFORCEMENTS/PREPS BY GATE DOOR MFG.

NOTE! G-02 DOES NOT REQUIRE CARD READER OR POWER/LOW VOLTAGE POWER

END OF SECTION

Legend:
↯ Electrified Opening

Door#	HwSet#
101A↯	AL-02
101B↯	AL-03
102↯	AL-01
103A	06
103B↯	AL-04
103C	BI-F100
103D	BI-F100
105A↯	05
105B	13
106	12
107	15
108	16
109	11
110	13
111	12
116A	10
116B	10
116C	BI-F100
117A	10
117B	BI-F100
118	12
119	12
120	14
121	10
122	09
125A	10
125B	BI-F100
126	12
127	13
129A↯	AL-01
129B	BI-F100
129C	08
201	12
204	16
205A	16
205B	12
206	16
207	16
208	13
209	16
210	15
212	15
213	16
214A	13

Door#	HwSet#
214B	13
215	07
216	12
301	FH-200
302	FH-200
303	FH-200
G-01↯	G-300
G-02	G-400
G-03↯	G-400
G-04	G-300

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers.

B. Section 07 27 00 - Air Barriers.

C. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

D. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

E. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

F. Section 08 51 13 - Aluminum Windows: Glazing provided by window manufacturer.

G. Section 08 83 00 - Mirrors.

H. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

K. GANA (GM) - GANA Glazing Manual; 2022.

L. GANA (SM) - GANA Sealant Manual; 2008.

M. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

N. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Saint Gobain North America: www.saint-gobain.com/#sle.
   5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Design Pressure: Calculated in accordance with ASCE 7.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
4. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:
   a. Water-Resistive Barriers: See Section 07 25 00.
   b. Air Barriers: See Section 07 27 00.
2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
1. Glass: Any of the manufacturers specified for float glass.
2. Guardian Glass, LLC; SunGuard SNX: www.guardianglass.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
4. Spacer Color: Black.
5. Edge Seal:
   a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   b. Color: Black.

6. Purge interpane space with dry air, hermetically sealed.
7. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
    a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.

D. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
    b. Coating: Low-E (passive type), on #2 surface.
4. Metal edge spacer.
5. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
6. Total Thickness: 1 inch; or 3/4-inch as noted on the Door and Window Schedule of the drawings.
7. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.27, nominal.
8. Visible Light Transmittance (VLT): 62 percent, nominal.
9. Solar Heat Gain Coefficient (SHGC): 0.27, nominal.
10. Visible Light Reflectance, Outside: 11 percent, nominal.
11. Glazing Method: Dry glazing method, gasket glazing.

E. Type IG-2 - Insulating Glass Units: Safety glazing.
1. Applications:
    a. Glazed lites in exterior doors.
    b. Glazed sidelights and panels next to doors.
    c. Other locations required by applicable federal, state, and local codes and regulations.
    d. Other locations indicated on drawings.
2. Space between lites filled with air.
3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
4. Tint: Clear.
5. Total Thickness: 1 inch; or 3/4-inch as noted on the Door and Window Schedule of the drawings.
6. Metal edge spacer.

2.05 GLAZING UNITS

A. Type G-1 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Heat-strengthened float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

B. Type G-2 - Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
    a. Glazed lites in doors, except fire doors.
    b. Glazed sidelights to doors, except in fire-rated walls and partitions.
    c. Other locations required by applicable federal, state, and local codes and regulations.
    d. Other locations indicated on drawings.
2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

2.06 GLAZING COMPOUNDS

A. Type GC-1 - Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; gray color.

B. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

C. Type GC-3 - Polysulfide Sealant: Two component; chemical curing, nonsagging type; ASTM C920 Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

D. Type GC-4 - Polyurethane Sealant: Single component, chemical curing, nonstaining, nonbleeding; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; _____ color.

E. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

F. Manufacturers:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Dow Corning Corporation: www.dowcorning.com/construction/#sle.Dow Corning Corporation: www.dowcorning.com/construction/#sle.
   3. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
   4. Momentive Performance Materials, Inc: www.momentive.com/#sle.
   5. Pecora Corporation: www.pecora.com/#sle.
   6. Tremco Commercial Sealants & Waterproofing; Proglaze: www.tremcosealants.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.07 SCHEDULES

A. Refer to drawings for schedule of glazing types.

END OF SECTION

SECTION 08 83 00
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.
   1. Annealed float glass.

1.02 RELATED REQUIREMENTS

A. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Metal mirror frames.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

C. ASTM C1036 - Standard Specification for Flat Glass; 2021.

D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

E. GANA (GM) - GANA Glazing Manual; 2022.

F. GANA (SM) - GANA Sealant Manual; 2008.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mirrors:
   1. Binswanger Mirror/ACI Distribution: www.binswangerglass.com/#sle.
   2. Lenoir Mirror Co: www.lenoirmirror.com/#sle.
   3. Trulite Glass and Aluminum Solutions: www.trulite.com/#sle.

4. Walker Glass Company Ltd; Walker Glass Mirrors: www.walkerglass.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: ASTM C1036, Type 1 - Transparent Flat, Class 1 - Clear, Quality - Q1 (high-quality mirrors); silvering, protective coating, and quality requirements in compliance with ASTM C1503.
   1. Thickness: 1/4 inch.
   2. Size: As indicated on drawings.

2.03 ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.

B. Glazing Clips: Manufacturer's standard type.

C. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

D. J-Shape Frame: Aluminum extrusion, 1/2 inch by 1/2 inch by 3/8 inch deep.
   1. Material: Comply with ASTM B221 (ASTM B221M), 6005-T6 alloy and temper.
   2. Finish: Anodized, clear.
   3. Manufacturers:
      a. Eagle Mouldings, Inc; Aluminum J Caps and Channels: www.eagle-aluminum.com/#sle.
      b. Andscot Company, Inc..
      c. Laurence, C.R. Co., Inc..
      d. Stylemark, Inc.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Frameless Mirrors: Set mirrors with clips, and anchor rigidly to wall construction.

3.04 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient LVT.
   2. Carpet tile.
   3. Thin-set ceramic tile.

B. Removal of existing floor coverings.

C. Patching compound.

D. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.02 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.

1.03 REFERENCE STANDARDS

A. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Copy of RFCI (RWP).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Latex-based product used to fill cracks, fasteners or knotholees and low-level area in plywood subfloors.
   2. Products:
      a. DAP Floor Patch & Leveler; www.dap.com
      b. DAP Flexuble Floor Patch and Leveler.
      c. Henry Premixed Patch n' Level.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.02 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.03 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.04 APPLICATION OF REMEDIAL FLOOR TREATMENT

A. Comply with requirements and recommendations of treatment manufacturer.

B. Using a broad knife or smooth fac trowel, apply floor patch product directly to the area to be filled.

C. Apply up to 1/4-inch and let dry approximatley 6 hours to a hard finish. For thickness greater than 1-4/-inch, apply in kultiple coats allowing each coat to dry completely between applications.

D. Feathe edge of all applications to ensure a smooth surface. Product cannot be sanded smooth.

3.05 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal channel ceiling framing.

C. Acoustic insulation.

D. Cementitious backing board.

E. Gypsum wallboard.

F. Joint treatment and accessories.

G. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Building framing and sheathing.

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

D. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

E. Section 07 27 00 - Air Barriers: Air- and water-resistive barrier over sheathing.

F. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

G. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

H. Section 09 30 00 - Tiling: Tile backing board.

1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

D. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.

E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

F. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.

G. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

H. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2020).

I. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

J. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

K. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

L. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

M. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

N. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

O. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022.

P. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

Q. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).

R. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

S. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

T. ASTM E413 - Classification for Rating Sound Insulation; 2022.

U. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

V. GA-600 - Fire Resistance and Sound Control Design Manual; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Install service utilities in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 3 years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.

2.02 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

B. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#sle.
   2. MarinoWARE: www.marinoware.com/#sle.
   3. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
   4. Steel Construction Systems: www.steelconsystems.com/#sle.
   5. Mill Steel Framing: www.millsteelframing.com.
   6. Telling Industries: www.buildstrong.com
   7. Substitutions: See Section 01 60 00 - Product Requirements.

C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Runners: U shaped, sized to match studs.
   2. Ceiling Channels: C-shaped.
   3. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
   4. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.
      a. Products:
         1) Same manufacturer as other framing materials.
         2) ClarkDietrich; RC Deluxe Resilient Channel: www.clarkdietrich.com/#sle.
         3) Substitutions: See Section 01 60 00 - Product Requirements.

D. Non-structural Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

E. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.
   1. Products:
      a. USG Corporation; Drywall Suspension System: www.usg.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   4. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com/#sle.
   5. PABCO Gypsum: www.pabcogypsum.com/#sle.
   6. USG Corporation: www.usg.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   4. Paper-Faced Products:
      a. American Gypsum Company; LightRoc Gypsum Wallboard: www.americangypsum.com/#sle.
      b. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
      c. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.

d. Georgia-Pacific Gypsum; ToughRock: www.gpgypsum.com/#sle.
e. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
f. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
g. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield C 5/8" Gypsum Board: www.goldbondbuilding.com/#sle.
h. USG Corporation; Sheetrock Brand EcoSmart Panels Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
i. USG Corporation; Sheetrock Brand Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.
j. Substitutions: See Section 01 60 00 - Product Requirements.

C. Impact Resistant Wallboard:
1. Application: High-traffic areas indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Type: Fire-resistance-rated Type X, UL or WH listed.
4. Thickness: 5/8 inch.
5. Edges: Tapered.
6. Paper-Faced Products:
a. American Gypsum Company; M-Bloc IR Type X: www.americangypsum.com/#sle.
b. CertainTeed Corporation; Extreme Impact Resistant Drywall with M2Tech: www.certainteed.com/#sle.
c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Hi-Impact Gypsum Board: www.goldbondbuilding.com/#sle.
d. USG Corporation; Sheetrock Brand Mold Tough VHI Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.

D. Backing Board For Wet Areas: One of the following products:
1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
a. Thickness: 5/8 inch.
b. Products:
1) Custom Building Products: www.custombuildingproducts.com/#sle.
2) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.
3) USG Corporation; Fiberock Brand Aqua-Tough AR Interior Panels Regular 5/8 in. (15.9 mm): www.usg.com/#sle.
4) Substitutions: See Section 01 60 00 - Product Requirements.
3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
a. Regular Type: Thickness 5/8 inch.
b. Products:
1) CertainTeed Corporation; 5/8" GlasRoc Tile Backer Type X: www.certainteed.com/#sle.
2) Georgia-Pacific Gypsum; DensShield Tile Backer: www.gpgypsum.com/#sle.
3) USG Corporation; Durock Brand Glass-Mat Tile Backerboard 5/8 in. (15.9 mm): www.usg.com/#sle.
4) Substitutions: See Section 01 60 00 - Product Requirements.

E. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Application: Vertical surfaces behind thinset tile, except in wet areas.

2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
3. Type: Regular and Type X, in locations indicated.
4. Type X Thickness: 5/8 inch.
5. Regular Board Thickness: 5/8 inch.
6. Edges: Tapered.
7. Products:
   a. American Gypsum Company; M-Bloc: www.americangypsum.com/#sle.
   b. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
   c. Georgia-Pacific Gypsum; ToughRock Mold-Guard Gypsum Board: www.gpgypsum.com/#sle.
   d. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
   e. Substitutions: See Section 01 60 00 - Product Requirements.

F. Acoustical Fiberboard: ASTM C208 cellulosic fiberboard without facing or coating; square edged.
1. Thickness: 1/2 inch.
2. Products:
   a. Blue Ridge Fiberboard, a W.R. Meadows Company; Soundstop: www.wrmeadows.com/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

G. Exterior Sheathing Board: See Section 06 10 00.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 3-1/2 inch.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
1. Products:
   a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
   b. USG Sheetrock Brand- Acoustical Sealant www.usg.com/#sle.
   c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Water-Resistive Barrier: See Section 07 25 00.

D. Air Barrier: See Section 07 27 00.

E. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
1. Types: As detailed or required for finished appearance.
2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
3. Products:
   a. Same manufacturer as framing materials.
   b. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
   c. Trim-tex, Inc: www.trim-tex.com/#sle.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.

3. Joint Compound: Drying type, vinyl-based, ready-mixed.
    a. Products:
        1) CertainTeed Corporation; Extreme All-Purpose Joint Compound: www.certainteed.com/#sle.
        2) USG Sheetrock Brand; All-Purpose Joint Compound: www.usg.com/#sle.
        3) Substitutions: See Section 01 60 00 - Product Requirements.
4. Joint Compound: Setting type, field-mixed.

G. Textured Finish Materials: Latex-based compound; plain.
1. Products:
    a. CertainTeed Corporation; Extreme Texture Coat/Acrylic Texture with M2Tech: www.certainteed.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

I. Screws for Attachment to Wood Members: ASTM C514.

J. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
1. Level ceiling system to a tolerance of 1/1200.

B. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

C. Blocking: Install wood blocking for support of:
1. Framed openings.
2. Wall-mounted cabinets.
3. Toilet accessories.
4. Wall-mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
1. Place one bead continuously on substrate before installation of perimeter framing members.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board perpendicular to framing, with ends and edges occurring over firm bearing.
1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

F. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive textured wall and paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions.

B. Texture Required: Provide textured finish at locations scheduled on the drawings.
   1. Light Orange Peel Texture: Texture applied over Level 4 gypsum noard finish; typical at all exposed to view wall and ceiling finishes as scheduled.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.09 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

3.10 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 09 24 00
CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Portland cement exterior wall covering (stucco) applied over air and water resistive barriers, continuous insulation, metal lath, stucco scratch and brown coat and inegrally colored and textured finish coat.

B. New portland cement exterior wall covering (stucco) over applied existing wall sheathing.

1.02 RELATED REQUIREMENTS

A. Section 02 41 00 - Demolition: Removal of existing stucco exterior finish system on existing wood framed wall and plywood sheathing.

B. Section 06 10 00 - Rough Carpentry: Wood stud framing for plaster.

C. Section 07 25 00 - Weather Barriers: Air and Water-resistive barrier (AWRB).

1.03 REFERENCE STANDARDS

A. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2022a.

B. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2023a.

C. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 2006 (Reapproved 2024).

D. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2023.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide data on insulation board, lath, water-resistant barrier, portland cement stucco materials and trim accessories.

C. Samples:
   1. Submit two samples, 12 by 12 inch in size illustrating finish color and texture.

D. Evaluation Service Reports: Show compliance with specified requirements.

E. Store materials inside under cover, and keep the dry and protected against damage from weather, moisture, direct sunlight, surae contamination, corrosion, construction traffic and other causes.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 MOCK-UPS

A. Mock-Up Panel: Construct a 4 foot wide by 8 foot high sample panel of plaster work at the jobsite demonstrating installation procedures, finish texture, and color. Show each phase of installation including framing and reinforcement.

B. Construct mock-up of exterior wall, 4 feet long by 8 feet wide, illustrating surface finish.
   1. Locate where directed.
   2. Mock-up may remain as part of this work; if approved by Architect/ Owner.

1.07 FIELD CONDITIONS

A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.

B. Factory-Preapred Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

A. Lath Plaster Base: Metal lath.
   1. Plaster Type: Factory prepared plaster mix.
   2. First Coat: Apply to a nominal thickness of 3/8 inch.
   3. Second Coat: Apply to a nominal thickness of 3/8 inch.
   4. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
   5. Finish Coat: Apply to a nominal thickness of 1/8 inch.

2.02 FACTORY PREPARED CEMENT PLASTER

A. Exterior portland cement plaster (stucco) system made of scratch and brown base coat and elastomeric finish coat; install in accordance with ASTM C926.
   1. Provide continuous exterior insulation as part of the system, by the same manufacturer.
      a. Molded Expanded Polystyrene Insulation Board: Conforming to ASTM C578, Type I; 1-1/2 inch minimum thickness.
   2. Provide weather resistive barrier as part of the system. Refer to Section 07 25 00-Weather Barriers
   3. Manufacturer - Basis of Design:
      a. Sto Corp; Sto Powerwall ci: www.stocorp.com/#sle
   4. Other Acceptable Manufacturers:
      a. LaHabra; FastWall 300: www.lahabrastucco.com/#sle.
      b. Sika Corporation; Parex Armourwall 300: www.parex.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Premixed Textured Coating: Polymer modified acrylic coating, integrally colored, and trowel applied to substrates prepared in accordance with manufacturer's written installation instructions.
   1. Color: As selected by Architect from manufacturer's standard colors.
   2. Manufacturers:
      a. Sto Corp; Powerflex Fine: www.stocorp.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 METAL LATH

A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but not limited to the following:
      a. Alabama Metal Industries Company; a Gibraltar Industries Company.
      b. CEMCO; California Expanded Metal Products Co.
      c. ClarkDietrich.
      d. MarinWARE.
      e. Phillips Manufacturing Co.
   2. Diamond-Mesh Lath: Steel, self-furring, 2.5 ib/sq. yd.
      a. Use for vertical andsoffit/ ceiling applications.

B. Wire-Fabric Lath:
   1. Welded Woven-Wire Lath: ASTM C1032; self-furring, with stiffener wire backing; 2.5 lb/sq. yd.

a. Alternate Product: Use for vertical applications.

2.04 ACCESSORIES

A. Finishing Accessories: ASTM C1063; galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.Coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Alabama Metal Industries Company; a Gibralter Industries Company.
      b. CEMCO; California Expanded Metal Products Co.
      c. ClarkDietrich.
      d. MarinWARE.
      e. Phillips Manufacturing Co.
   2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet; ASTM A653/A653M, G60 zinc coating.
   3. Cornerite: Fabricated from metal lath with ASTM A653/A653M, G60 zinc coating.
   4. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
      a. Small-nose cornerbead with expanded flanges; use unless otherwise indicated.
      b. Small-nose cornerbead with perforated flanges; use on curved corners.
      c. Small-nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
      d. Bullnose cornerbead, radius 3/4-inch minimum, with expanded flanges; use at locations indicated on Drawings.
   5. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style, with expanded flanges.
   6. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
   7. Expansion Joints: Fabricated from folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
   8. Two-Piece Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8-inch wide; with perforated flanges.

2.05 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or damaging plaster, lath or accessories.

B. Reinforcing Mesh: alkali-resistant glass fiber mesh, nominal 4.2 oz/sq yd., manufactured for use in cement plaster.

C. Water-Resistive Barrier: See Section 07 25 00.

D. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.

E. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated or required.

F. Rainscreen Drainage Material:
   1. Rainscreen Drainage Mat: Polyester or polypropylene mesh.
      a. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
      b. Seam Tape and Bug Screen: As recommended by rainscreen drainage mat manufacturer.
      c. Manufacturers:
         1) Sto Corp; Sto Powerwall ci: www.stocorp.com/#sle.

2) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify masonry joints are flush and surfaces are ready to receive work of this section, and that there are no existing bituminous or water repellent coatings on masonry surfaces.

C. Verify concrete surfaces are flat, honeycombs are filled flush, and surfaces are ready to receive work of this section, and that there are no existing bituminous, water repellent, or form release agent coatings on concrete surfaces that may be detrimental to plaster bond.

D. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.

E. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

3.02 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

B. Clean existing exterior cement plaster (stucco) and concrete surfaces of foreign matter using approved acid solutions, solvents, or detergents, and then rinse surfaces thoroughly with clean water.

C. Apply dash bond coat of plaster to solid bases and moist cure for at least 24 hours before applying first coat of jobsite mixed plaster.

D. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

A. Where a fluid-applied water-resistive barrier is applied to sheathing, install continuopus insulation.

B. Where cement plaster is installed as part of a barrier wall system, install two layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions.

C. Integrate water-resistive barrier with flashing accessories, and adjacent doors, windows, penetrations, and cladding transitions.

D. Apply water-resistive barrier horizontally with upper layer lapped over lower layer at least 2 inches.

E. Lap water-resistive barrier at least 6 inches at vertical joints.

F. Lap water-resistive barrier at least 16 inches beyond vertical line of inside and outside corners in both directions.

G. For two layer applications, start with two horizontal layers at bottom of exterior wall or structure.

3.04 INSTALLATION - RAINSCREEN DRAINAGE MATERIAL

A. Install rainscreen drainage or drainage mat material and metal lath with accessories over sheathing material and water-resistive barrier with fastening system in accordance with ASTM C1063 into wood or metal studs. Install drainage material with filter fabric mortar screen to exterior.

3.05 INSTALLING METAL LATH

A. Metal Lath: Install according to ASTM C1063.
   1. Vertical Applications: Install woven-wire lath.
   2. Horizontal Applications: Install flat-diamond mesh lath.
   3. On Solid Surfaces: Install self-furring, diamond-mesh lath.

3.06 INSTALLING ACCESSORIES

A. Install according to ASTM C1063 and at locations indicated on Drawings.

B. Reinforcement for External (Outside) Corners:
   1. Install lath- type, external-corner reinforcement at exterior locations.

C. Control Joints: Locate as indicated on Drawings, and as approved by Architect for visual effect as follows:
   1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
      a. Vertical Surfaces: 144 sq. ft.
      b. Horizontal and Other Non-vertical Surfaces: 100 sq. ft.

D. At distances between control joints of not greater than 18 feet o.c.

E. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2: 1.

F. Where control joints occur in surface of construction directly behind plaster.

G. Where plasterwork areas change dimensions, too delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.07 MIXING

A. Mix only as much plaster as can be used prior to initial set.

B. Mix materials dry, to uniform color and consistency, before adding water.

C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.08 APPLICATION

A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.
   1. Do not deviate more than plus or minus 1/4-inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
   2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at frame, cut base coat free from metal frame before plaster sets and groove finish coat at juncture with metal.
   3. Provide plaster surfaces that are ready to receive field-applies finishes indicated.

B. Walls: Base Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork with 3/4-inch thickness as follows:
   1. Apply base coat(s) to fully embed lath and to specified thickness.
   2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.

C. Ceilings/ Soffits: Base Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork with 1/2-inch thickness.

D. Finish Coats:
   1. Cement Plaster:
      a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
      b. Apply desired surface texture while mix is still workable.
      c. Float to a consistent finish.
   2. Primer and Acrylic - Based Coatings:
      a. Remove surface contaminants such as dust and dirt without damaging substrate.
      b. Apply primer in accordance with manufacturer's instructions.
      c. Apply finish coating in number of coats and to thickness recommended by manufacturer and according to manufacturer's written instructions.

3.09 TOLERANCES

A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

3.10 REPAIR

A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

B. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair walls and other surfaces stained, marred, or otherwise damaged during plastering

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Ceramic trim.

E. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017.

B. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

C. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

F. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2024).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

L. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).

N. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

O. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

P. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2019.

Q. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.

R. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.

S. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2014 (Reaffirmed 2019).

T. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).

U. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2019.

V. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

W. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018.

X. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Provide manufacturer samples illustrating pattern, color variations and grout joint size variations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 12 of each type.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: Basis of Design
   1. Dal-Tile Corporation: www.daltile.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. WT-1 - Glazed Wall Tile: ANSI A137.1 standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: 4 by 12 inch, nominal.
   3. Edges: Cushioned.
   4. Surface Finish: Semi-Gloss as selected.
   5. Color(s): Arctic White.
   6. Pattern: SEE DRAWINGS. MIX OF 6X6 AND 3X6 TILES
   7. Trim Units: Matching surface bullnose, cove, and base shapes in sizes coordinated with field tile.
   8. Products:
      a. Dal-Tile Corporation; Linear Color Wheel: www.daltile.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. FT - 1 FLOOR TILE - Porcelain Tile: ANSI A137.1 standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 12 by 24 inch, nominal;
   3. Thickness: 1/2 inch.
   4. Edges: Interlocking shape.
   5. Surface Finish: Matte glazed.
   6. Color(s): To be selected by Architect from manufacturer's standard range.
      a. Color: HM03 Granite.
   7. Pattern: 50% Offset installation pattern
   8. Floor Underlayment: Provide Dal Tile RapidPrep Underlayment under floor tile to comply with manufacturer warranty requirements.
   9. Grout: Provide Dal Tile Tapid Grout; flexible single component grout designed for tile with ClicFit technology; required to comply with manufacturer warranty requirements.
   10. Products:
      a. Dal-Tile Corporation WANDERWISE, STONE LOOK: www.daltile.com/#sle.
         1) COLOR: SWAN, WW01
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of wall tile.
      b. Open edges of floor tile.
      c. Wall corners, outside and inside.
      d. Transition between floor finishes of different heights.
   2. Manufacturers:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Genesis APS International: www.genesis-aps.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SETTING MATERIALS

A. Manufacturers:
1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
2. Custom Building Products: www.custombuildingproducts.com/#sle.
3. LATICRETE International, Inc: www.laticrete.com/#sle.
4. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
1. Applications: Use this type of bond coat where Large and Heavy Tile (LHT) mortar is indicated.
2. Products:
a. ARDEX Engineered Cements; ARDEX X 5: www.ardexamericas.com/#sle.
b. Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
c. Merkrete, by Parex USA, Inc; Merkrete 735 Premium Flex: www.merkrete.com/#sle.
d. Sika Corp; SikaTile 300 Set: www.sika.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
1. Applications: Use this type of bond coat where Large and Heavy Tile (LHT) mortar is indicated.
2. Products:
a. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
b. LATICRETE International, Inc; MULTIMAX LITE: www.laticrete.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GROUTS

A. Manufacturers:
1. LATICRETE International, Inc: www.laticrete.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color(s): As selected by Architect from manufacturer's full line. Dark gray grout.
4. Products:
a. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.
c. **COLOR: NATURAL GREY 24**

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
2. Color(s): As selected by Architect from manufacturer's full line.
3. Products:
a. ARDEX Engineered Cements; ARDEX SX: www.ardexamericas.com/#sle.

b. Custom Building Products; Commercial 100% Silicone Caulk: www.custombuildingproducts.com/#sle.
c. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
d. Merkrete, by Parex USA, Inc; Merkrete Colored Caulking: www.merkrete.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. Composition: Water-based colorless silicone.
2. Products:
a. Merkrete, by Parex USA, Inc; Merkrete Revive: www.merkrete.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ACCESSORY MATERIALS

A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
2. Fluid or Trowel Applied Type:
a. Material: Synthetic rubber or Acrylic.
b. Thickness: 25 mils, minimum, dry film thickness.
c. Products:
1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
2) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
3) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane: www.tecspecialty.com/#sle.
4) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
5) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 1: www.merkrete.com/#sle.

B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 5/8 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
1. Products:
a. Custom Building Products; WonderBoard Lite Backerboard: www.custombuildingproducts.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Use uncoupling membrane under all tile unless other underlayment is indicated.

B. Over wood substrates, install in accordance with TCNA (HB) Method F142, with polymer modified cement grout grout, unless otherwise indicated.

3.05 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244.

B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

C. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.08 SCHEDULE

A. Refer to Floor Finish Plan and Room Finish Schedule of the drawings for location of ceramic floor and wall tile.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 07 21 00 - Thermal Insulation: Acoustical insulation.

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; 2025a.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls/#sle.
   3. Rockfon: www.rockfon.com/#sle.
   4. USG Corporation: www.usg.com/ceilings/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls/#sle.
   3. Rockfon: www.rockfon.com/#sle.
   4. USG Corporation: www.usg.com/ceilings/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels ACT-1: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 2, water felted.
      b. Pattern: Non-directional fissured.
   2. Size: 24 by 24 inches.
   3. Thickness: 5/8 inch.
   4. Light Reflectance: 0.80 percent, determined in accordance with ASTM E1264.
   5. NRC Range: 0.55 to ____, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 33, determined in accordance with ASTM E1264.
   7. Panel Edge: Angled Tegular.
   8. Color: White.
   9. Suspension System: Exposed grid.
   10. Products:
      a. Armstrong World Industries, Inc; Cortega Tegular 704: www.armstrongceilings.com/#sle.
      b. Armstrong World Industries, Inc; Fine Fissured: www.armstrongceilings.com/#sle.
      c. USG Corporation: www.usg.com/ceilings/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

B. Exposed Suspension System, Type A: Hot-dipped galvanized steel grid with steel cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch face width.
   3. Finish: Baked enamel.
   4. Color: White.
   5. Products:
      a. CertainTeed Corporation; 15/16" EZ Stab Classic System: www.certainteed.com/ceilings-and-walls/#sle.
      b. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.

c. Armstrong World Industries, Inc; Preldue XL 15/16": www.armstrongceilings.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
1. Size: As required for installation conditions.
2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
3. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.

D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.
2. Overlap and rivet corners.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 09 54 23
LINEAR METAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Linear metal ceilings.

B. Suspended metal support system and perimeter trim.

C. Supplementary insulation above ceiling.

D. Accessories; provide other necessary items including devices for attachment overhead construction, secondary members, splines, splices, connecting clips, wall connectors, wall angles, and other devices required for a complete installation.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2022.

D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.

1.03 DESIGN REQUIREMENTS

A. Design components to ensure light fixtures will not induce eccentric loads. Where components may induce rotation of ceiling system components, provide stabilizing reinforcement.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

B. Preinstallation Meeting: Convene one week before starting work of this section.

C. Sequencing: Supply hanger clips during steel deck erection. Supply additional hangers and inserts as required.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Furnish for component profiles.

C. Shop Drawings: Indicate reflected ceiling plan, location of mechanical and electrical components, and details of junction with dissimilar materials.

D. Samples: Submit two samples 11 by 11 inch in size illustrating color and finish of components exposed to view.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements for additional provisions.

1.06 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section.
   1. Minimum three years documented experience.
   2. Approved by metal ceiling manufacturer.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc.

1.07 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Locate mock-up where directed.

C. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Accept factory-finished products on site in manufacturer's unopened factory packaging only; reject opened packages.

B. Protect factory-finished products from damage to appearance by storing products in manufacturer's unopened factory packaging in dry storage area.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 1- year manufacturer warranty; include coverage for corrosion resistance and discoloration of surface finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Linear Metal Ceilings:
   1. Basis of Design: ROCKFON PLANAR MACRO AND PLANAR MACROPLUS LINEAR CEILING SYSTEM
      a. PERFORATED FOR THE HIGH CEILINGS
      b. NON PERFORATED FOR THE LOW CEILINGS
   2. Rockfon: www.rockfon.com/#sle.
   3. CERTAINTEED .
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LINEAR METAL CEILINGS

A. Linear Metal Ceiling System: Panels, suspension members, trim, and accessories as required to provide a complete system.

B. Performance Requirements:
   1. Design to support imposed loads of indicated items without eccentric loading of supports.
   2. Design for maximum deflection of 1/360 of span.
   3. Noise Reduction Coefficient (NRC): 0.75, measured in accordance with ASTM C423 with insulation installed.

2.03 COMPONENTS

A. Linear Metal Panels:
   1. Type: Linear panel with reveals; snap-in installation.
      a. Panel Profile: Channel shaped with square edges; 6 inch widths
      b. Panel Depth: 5/8 inch.
      c. Spacing: 3/4 inch reveal between panels.
   2. Material: Aluminum sheet, ASTM B209/B209M.
      a. Finish - 552 DESERT PINE

B. Acoustical Backer: Manufacturer's standard black non-woven fabric; as required to achieve specified acoustic performance; with 1 inch thick fiberglass fiber. Color black

C. Edge Molding, Expansion Joints, and Splices: Same material, thickness, and finish as linear panels.

D. End Caps: Formed metal; same color and finish as sight-exposed surfaces of linear panels.

E. Accessories: Stabilizer bars as required for suspended grid system; sight-exposed surfaces same color and finish as sight-exposed surfaces of linear panels.

F. Suspension Members: Formed aluminum sections, with integral attachment points; primed finish; size and type to suit application and ceiling system flatness requirement specified.

G. Suspension Wire: Steel, annealed, galvanized finish, 12 gauge, ___ inch diameter.

H. Subgirt Members: Hot-dip galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating; formed to resist imposed loads and to provide attachment for linear ceiling and accessories.

I. Touch-up Paint For Concealed Items: Zinc rich type.

2.04 FABRICATION

A. Shop cut linear panels to accommodate mechanical and electrical items.

B. Factory-form internal and external corners of same material, thickness, finish, and profile to match exposed linear panels ; back brace internal corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Suspension Components:
   1. Install after above-ceiling work is complete in accordance with manufacturer's instructions, ASTM C636/C636M, and ASTM E580/E580M.
   2. Hang carrying members independent of walls, columns, ducts, light fixtures, pipe, and conduit; where carrying members are spliced, avoid visible displacement of face panels with adjacent panels.
   3. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers to span the required distance.

B. Linear Metal Ceiling:
   1. Suspend ceiling hangers
   2. Install linear panels and other system components in accordance with manufacturer's instructions.
   3. Stagger end joints minimum 12 inches.
   4. Butt interior end joints tight.
   5. Field miter corners at changes in panel direction.
   6. Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.
   7. Install end caps at sight-exposed ends of linear panels.
   8. Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.

C. Insulation: Install above panel members; fit tight between grid members ; place insulation with facing side down.

3.03 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation From Dimensioned Position: 1/4 inch.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers; 1998 (Reapproved 2015).

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

C. ASTM E492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine; 2025.

D. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.

E. ASTM E2179 - Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors; 2025.

F. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

G. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

H. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

I. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2020).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 16 square feet of each type and color.
   3. Extra Wall Base: 24 linear feet of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. VCT -1 (KITCHEN) Vinyl Composition Tile
   1. Manufacturers:
      a. Armstrong Flooring; Standard Execelon Imperial Texture: www.armstrongflooring.com/#sle.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Size: 12 by 12 inch.
   4. Thickness: 0.125 inch.
   5. Color: 522 STEEL WORKS W TA6 BEDROCK CG
   6. Color: To be selected by Architect from manufacturer's full range.

B. Vinyl Tile (LVT-1): Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
   1. Manufacturers:
      a. Mannington Commercial; SPACIA COLLECTION, SPRING MAPLE: www.manningtoncommercial.com#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Square Tile Size: 7.25" X 48"
   3. Wear Layer Thickness: 0.020 inch (20 mil)
   4. Total Thickness: 0.177 inch; (4.5mm)
   5. Tile Edge: Straight.
   6. Pattern: Brick Lay
   7. Color: SPRING MAPLE

C. Vinyl Tile (LVT-2 THROUGH LVT-6): Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
   1. Manufacturers:
      a. Mannington Commercial; COLOR ANCHOR, STRIDE, COLORS PER PLANS: www.manningtoncommercial.com#sle.
   2. Tile Size: 6" x 36" plank
   3. Wear Layer Thickness: 0.020 inch (20 mil)

4. Total Thickness: 0.177 inch; (4.5mm)
5. Tile Edge: Straight.
6. Pattern: Per Drawings
    a. Color: To be selected by Architect from manufacturer's full range; Stone floor tile collection.

2.02 STAIR COVERING

A. Stair Treads with Integral Risers: Rubber; full height of riser, full width and depth of tread in one piece; tapered thickness.
1. Manufacturers:
    a. Johnsonite, a Tarkett Company; _____: www.johnsonite.com.
2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
3. Nosing: Square.
4. Striping: 2 inch wide contrasting color abrasive strips.
5. Tread Texture: Smooth.
6. Tread Pattern: Match Bamboo tread pattern.
7. Color: As indicated on drawings.
8. Color: To be selected by Architect from manufacturer's full range.

B. Stair Stringers: Full height in one piece and in maximum available lengths, matching treads in material and color.
1. Manufacturers:
    a. Johnsonite, a Tarkett Company; _____: www.johnsonite.com/#sle.
2. Nominal Thickness: 0.080 inch.

C. Stair Nosings: 1-1/2 inch horizontal return, 1-1/8 inch vertical return, full width of stair tread in one piece.
1. Manufacturers:
    a. Johnsonite, a Tarkett Company; _____: www.johnsonite.com/#sle.
    b. Mannington Commercial; _____: www.manningtoncommercial.com#sle.
    c. Substitutions: See Section 01 60 00 - Product Requirements.
2. Material: Rubber.
3. Nominal Thickness: 0.125 inch.
4. Texture: Smooth.
5. Color: To match stair treads.

2.03 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
1. Manufacturers:
    a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Height: 4 inch.
3. Thickness: 0.125 inch.
4. Finish: Satin.
5. Length: Roll.
6. Color: Silver Grey 55 (Note that Stair Risers and Treads to Match)
7. Accessories: Premolded external corners and internal corners.

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Adhesive for Resilient Flooring:
1. Manufacturers:

a. LVT Flooring:
   1) Shaw 4100 or S150
b. VCT Flooring:
   1) Mapei Ultrabond ECI 711 Thin-Spread VCT Adhesive
c. Wall Base:
   1) Mapei ECO 575 Premium Wall Base Adhesive
d. Substitutions: Section 01 60 00 - Product Requirements.

D. Moldings, Transition and Edge Strips: Rubber.
1. Manufacturers:
   a. Mannington Commercial: www.manningtoncommercial.com#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

B. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of wall conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
1. Spread only enough adhesive to permit installation of materials before initial set.
2. Fit joints and butt seams tightly.
3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Loose-Laid Installation: Set flooring in place in accordance with manufacturer's instructions.

E. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
1. Resilient Strips: Attach to substrate using adhesive.

G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install plank tile with in 'Brick Lay' installation pattern.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Install stringers configured tightly to stair profile.

C. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.09 SCHEDULE

A. Refer to Floor Finish Plan and Room Finish Schedule for the drawings for locations of the resilient base finishes.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity remediation procedures.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.

C. CRI 104 - Standard for Installation of Commercial Carpet; 2018.

D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting: Basis of Design
   1. Mannington Commercial; _____: www.manningtoncommercial.com#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. CPT-1 (FIELD CARPET TILE FOR OFFICE AREA)
1. Product: ARIE, DAPPER DIALOGUE
2. Tile Size: 12" X 36"
3. Color: CRAFTED RENEWAL 14611
4. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
5. Stitches: 10 per inch.
6. Pile Weight: 15 oz/sq yd.
7. Density Factor: 6236 kilotex.
8. Primary Backing Material: PER MFR RECOMMENDATIONS.

B. B. CPT-2 (WALK OFF TILE)
1. Product: RUFFIAN II
2. Tile Size: 24 X 24 INCH, nominal.
3. Color: EBONY EARTH 1506
4. Pattern: Textured Pattern Loop surface texture.
5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
6. Stitches: 10 per inch.
7. Pile Weight: 15 oz/sq yd.
8. Primary Backing Material: AS RECOMMENDED BY MFR.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, color as selected by Architect.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in quarter turn pattern.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove excess adhesive without damage, from floor, base, and wall surfaces.

C. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

B. Section 09 91 23 - Interior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

F. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

2. Where sheen is not specified, submit each color in each sheen available.
    a. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
1. Base Manufacturer: Sherwin-Williams Company:www.sherwin-williams.com/#sle.
2. Benjamin Moore & Co.: www.benjaminmoore.com.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
         1) Opaque, Flat: 50 g/L, maximum.
         2) Opaque, Nonflat: 150 g/L, maximum.
         3) Opaque, High Gloss: 250 g/L, maximum.
      c. Architectural coatings VOC limits of the State in which the Project is located.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer; Sherwin Williams kem Kromik Universal Metal Primer Off-White (B50WZ001).
   2. Semi-gloss: Two coats of alkyd enamel; Sherwin Williams DTM Enamel Pure White/ Tint Base Semi-Gloss (B55W00101).

B. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer; Sherwin Williams Kem Kromik Universal Metal Primer Off-White (B50WZ001)
   2. Semi-gloss: Two coats of alkyd enamel; [Sherwin Williams DTM Enamel Pure White/ Tint Base Semi-Gloss (B55W00101)].

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

G. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

H. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

I. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 SCHEDULE - PAINT SYSTEMS

A. Steel Fabrications: Finish surfaces exposed to view.
   1. Exterior: ME-OP-2A, semi-gloss.

B. Shop-Primed Metal Items: Finish surfaces exposed to view.
   1. Finish the following items:
      a. Exposed surfaces of structural steel.
      b. Exposed surfaces of steel guardrails and ladders.
   2. Exterior: Paint-ME-OP-2A, semi-gloss.

3.07 COLOR SCHEDULE

A. The following exterior paint colors to be selected by Architect.
   1. New steel structural members including exposed columns and beams
   2. Steel fabrications.
   3. Exterior hollow metal doors and frames.
   4. Composite and wood trim.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

B. Section 05 51 00 - Metal Stairs: Shop-primed items.

C. Section 05 52 13- Pipe and Tube Railings: Shop-primed items.

D. Section 09 91 13 - Exterior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 9 feet long by 8 feet wide, illustrating paint color, texture, and finish.

C. Provide door and frame assembly illustrating paint color, texture, and finish.

D. Locate where directed by Architect.

E. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com/#sle..
2. Benjamin Moore & Co.: www.benjaminmoore.com.

C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
1) Opaque, Flat: 50 g/L, maximum.
2) Opaque, Nonflat: 150 g/L, maximum.
3) Opaque, High Gloss: 250 g/L, maximum.
c. Architectural coatings VOC limits of the State in which the Project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
3. Extend colors to surface edges; colors may change at any edge as directed by Architect.
4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.
5. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:

1. One coat of latex primer sealer; Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer (B28W2600).
2. Semi-gloss: Two coats of latex enamel; Sherwin-Williams Company: ProMar 200 Water-based Acrylic- Alkyd Semi-Gloss Coating (B34W8251)..

B. Paint MI-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with alkyd primer.

C. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with latex primer.
2. Semi-gloss: Two coats of latex enamel; Sherwin Williams Pro Industrial DTM Acrylic Semi-Gloss Extra White (B66W01151).

D. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
1. One coat of alkyd primer sealer.; Sherwin Williams Pro Industrial DTM Acrylic Semi-Gloss Extra White (B66W01151).
2. Semi-gloss: Two coats of latex enamel; Sherwin Williams Painters Edge Interior Latex Semi-Gloss White.
3. Eggshell: Two coats of latex enamel; Sherwin Williams Painters Edge Interior Latex Egshell White.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

H. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

I. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 SCHEDULE - PAINT SYSTEMS

A. Gypsum Board: Finish surfaces exposed to view.
1. Interior Ceilings and Bulkheads: GI-OP-3L, Semi-gloss per owner (confirm with owner).
2. Interior Walls: GI-OP-3A, egshell.
3. At wet areas, paint shall be water based epoxy
4. Products shoudl meet or exceed Scuff Tuff

B. Wood: Finish surfaces exposed to view, except glue-laminated wood beams.
1. Interior trim: WI-OP-3A, semi-gloss.

C. Steel Doors and Frames: Finish surfaces exposed to view;
1. MI-OP-2L, semi-gloss.

D. Steel Fabrications: Finish surfaces exposed to view.
1. Interior: MI-OP-3L, semi-gloss.

E. Shop-Primed Metal Items: Finish surfaces exposed to view.
1. Finish the following items:

a. Exposed steel fabrications
2. Interior: MI-OP-2L.

3.07 COLOR SCHEDULE

A. Interior paint colors to be selected by Architect
1. Walls
2. Walls- Accent
3. Soffits
4. Ceilings
5. Hollow metal doors and frames
6. Metal fabrications

END OF SECTION

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

B. Tackboards.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

C. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, tackboard, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

D. Manufacturer's printed installation instructions.

E. Maintenance Data: Include data on regular cleaning, stain removal .

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards:
   1. Manufacturers:
      a. AJW Architectural Products: www.ajw.com/#sle.
      b. ASI Visual Display Products: www.asi-visualdisplayproducts.com/#sle.
      c. Claridge Products and Equipment, Inc; LCS3 Markerboards: www.claridgeproducts.com/#sle.
      d. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Color: White.
   3. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
   4. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
   5. Backing: Aluminum foil, laminated to core.
   6. Height: 48 inches.
   7. Length: As indicated on drawings.
   8. Frame: Extruded aluminum , with concealed fasteners.
   9. Frame Finish: Anodized, natural.

10. Accessories: Provide marker tray.

B. Tackboards: Composition cork.
   1. Manufacturers:
      a. AJW Architectural Products; ____: www.ajw.com/#sle.
      b. Nelson Adams NACO; ____: www.nelsonadamsnaco.com/#sle.
      c. Forbo, Bulletion Board Tackable Surfaces.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Cork Thickness: 1/4 inch.
   3. Color: As selected from manufacturer's full range.
   4. Size: As indicated on drawings.
   5. Frame: Same type and finish as for markerboard.

2.02 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

C. Fiber Board: ASTM C208, cellulosic fiber board.

D. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

E. Adhesives: Type used by manufacturer.

2.03 ACCESSORIES

A. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

C. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowance for signs.

B. Room and door signs.

C. Interior directional and informational signs.

D. Plaque.

1.02 RELATED REQUIREMENTS

A. Section 10 14 19- Dimensional Letter Signage: Exterior building signage.

B. Section 26 51 00 - Interior Lighting: Exit signs required by code.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00 - Allowances, for cash allowances affecting this section.
   1. Interior Signage: Including room signs, interior directional and informational signs, and building dedication plaque.

B. Allowance amount covers purchase and delivery but not installation.

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

H. Manufacturer's Qualification Statement.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.08 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: APCO, Elevate. Sign Style
   1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
   2. FASTSIGNS: www.fastsigns.com/#sle.
   3. Inpro: www.inprocorp.com/#sle.
   4. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.
   5. Seton Identification Products: www.seton.com/aec/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Plaques:
   1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch.
   4. Sign Height: 3 inches, unless otherwise indicated.
   5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
   6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
   7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Interior Directional and Informational Signs:
   1. Sign Type: Same as room and door signs.
   2. Allow for 4 signs 4 inches high by 16 inches long.
   3. Wording of signs is scheduled on drawings.

D. Recognition/Donor Panels: Engraved panel media; individual name signs attached with magnetic tape to fixed panel.

1. Dimensions and Number of Name Signs: As indicated on drawings.
2. Provide all name signs whether engraved or not, for uniform overall appearance.
3. Color: Color as selected.

E. Plaque: See Allowance for details.

2.03 SIGN TYPES

A. Flat Signs: Signage media without frame.
1. Edges: Square.
2. Corners: Square.
3. Wall Mounting of One-Sided Signs: Concealed screws.
4. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.

B. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica, Arial, or other sans serif font.
2. Character Case: Upper case only.
3. Background Color: Clear.
4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
1. Total Thickness: 1/16 inch.

B. Applied Character Panels: Acrylic plastic base, with applied acrylic plastic letters and braille.
1. Total Thickness: 1/8 inch.
2. Letter Thickness: 1/8 inch.
3. Letter Edges: Square.

2.05 NON-TACTILE SIGNAGE MEDIA

A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:
1. Sign Color: Clear.
2. Total Thickness: 1/8 inch.

2.06 PLAQUES

2.07 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

3.03 SCHEDULE

A. A Signage Schedule will be provided by the Architect. For the purpose of developing the allowance amount, the following types of signs will be required for the project:
1. Room and door signs.
2. Conference/ Meeting Room signs.

3. Public and Staff toilet room signs.
4. Service rooms signs
5. No smoking signs

END OF SECTION

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dimensional letter signage.

1.02 PRICE AND PAYMENT PROCEDURES

A. Allowances:
   1. See Section 01 21 00 - Allowances for cash allowances affecting this section.
   2. Include cash allowance for purchase and delivery but not installation.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.

D. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Selection Samples: Where materials, colors, and finishes are not specified, submit two sets of selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

1.07 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dimensional Letter Signs:
   1. FASTSIGNS International, Inc; _____: www.fastsigns.com/#sle.
   2. Inpro Corporation; _____: www.inprocorp.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 DIMENSIONAL LETTERS

A. Applications: Building identification.
   1. Use individual metal letters.
   2. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters:
   1. Material: Aluminum casting.
   2. Thickness: Manufacturer's standard for letter size.
   3. Letter Height: As indicated on drawings.
   4. Text and Typeface:
      a. Character Font: Times or other serif font.
   5. Finish: Brushed, satin.
   6. Color: As selected.
   7. Mounting: As indicated on drawings.

2.04 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate dimensional letter signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until mm-dd-yyyy; repair or replace damaged items.

3.03 SCHEDULE- BUILDING EXTERIOR

A. Building Idenitification: Locations as indicated on the drawings
   1. Building street address numbers;
      a. Text: '296'
      b. Height: Minimum 4 inch
   2. Buiding Name:
      a. Text: 'BOYS & GIRLS CLUB'
         1) Height: Minimum 12 inches.
      b. Text: 'OF THE SOUTHERN UTE INDIAN TRIBE'
         1) Height: Minimum 6 inches.

END OF SECTION

SECTION 10 21 13.17
PHENOLIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Phenolic toilet compartments.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 6 by 6 inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Phenolic Toilet Compartments:
   1. All American Metal Corp - AAMCO: www.allamericanmetal.com/#sle.
   2. ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.
   3. ASI Global Partitions: www.asi-globalpartitions.com/#sle.
   4. Partition Systems International of South Carolina; Phenolic Toilet Partitions: www.psisc.com/#sle.
   5. Substitutions: Section 01 60 00 - Product Requirements.

2.02 PHENOLIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted unbraced.
   1. Color: To be selected from manufacturer's standard colors.

B. Doors:
   1. Thickness: 3/4 inch.
   2. Width: 24 inch.
   3. Width for Handicapped Use: 36 inch, out-swinging.
   4. Height: 58 inch.

C. Panels:
   1. Thickness: 1/2 inch.
   2. Height: 58 inch.
   3. Depth: As indicated on drawings.

D. Pilasters:
   1. Thickness: 3/4 inch.
   2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets with vertical support/bracing same as compartments.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666 Type 304 stainless steel with No. 4 finish, 3 inch high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Hollow anodized aluminum, 1 inch by 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.

C. Wall and Pilaster Brackets: Polished stainless steel; manufacturer's standard type for conditions indicated on drawings.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

E. Hardware: Polished stainless steel:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Door Latch: Slide type with exterior emergency access feature.
   3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   4. Coat hook with rubber bumper; one per compartment, mounted on door.
   5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

3.05 SCHEDULES

A. Girls Restroom 110: Two toilet stalls of floor mounted (accessible and standard stall types), head rail braced type; screen with pilaster bracing.

B. Boys Restroom 111: One floor mounted accessible toilet stall type, head rail braced type.

C. Girls Restroom 117: Two toilet stalls of floor mounted (accessible and standard stall types), head rail braced type; screen with pilaster bracing.

D. Boys Restroom 118: One floor mounted accessible toilet stall type, head rail braced type.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

B. Protective wall covering.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.

B. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

C. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, 24 inches long.
   2. Submit two samples of protective wall covering, 6 by 6 inches square.

D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Stock Materials: One package(s) of minimum 48 inches long unit of each kind of covers for corner guards and protective corridor handrails.
   3. Extra Stock Materials: 32 square feet of each kind of protective wall covering.

G. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

D. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for wall corner guards Complete forms in Owner's name and register with manufacturer.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Babcock-Davis: www.babcockdavis.com/#sle.
   2. Construction Specialties, Inc; Heavy Duty Corner Guards: www.c-sgroup.com/#sle.
   3. Inpro; Model 150 High Impact Corner Guard: www.inprocorp.com/#sle.
   4. Koroseal Interior Products: www.koroseal.com/#sle.
   5. American Floor Products: Thinline Comet Series Corner Guards: www.americanfloor.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Protective Wall Covering:
   1. Construction Specialties, Inc; Acrovyn High-Impact Wall Covering: www.c-sgroup.com/#sle.
   2. Inpro; Continuim Decorative Rigid Sheet: www.inprocorp.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

2.03 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Material: High impact vinyl with full height extruded aluminum retainer.
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
   3. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
   4. Width of Wings: 3 inches.
   5. Corner: Square.
   6. Color: BRUSHED NICKEL.
   7. Length: One piece.
   8. Preformed end caps.

B. Protective Wall Covering:
   1. Material: High-impact acrylic-modified vinyl.
   2. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
   3. Thickness: 0.040 inch.
   4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   5. Color:
   6. FRP 1 - WOODGRAINS (CORRIDORS AND LOBBY) - 3' HIGH
   7. FRP 2 - SOLID COLORS (KITCHEN) - FULL HEIGHT
   8. FRP 3 - SOLID COLORS (JANITOR/DISHWASHING AREA) - UP TO 6'
   9. Panel Size: 4' x 8'.
   10. Accessories: Provide manufacturer's standard color-matched trim and moldings.

a. Inside Corner Trim: Standard angle
b. Outside Corner Trim: Standard angle.

11. Mounting: Adhesive.

C. Adhesives and Primers: As recommended by manufacturer.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.

D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to 52 inches high.

C. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.

1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
2. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
4. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

3.05 SCHEDULE

A. Wall Corner Guards: Provide per the following general schedule and the drawings:

1. In public lobby, corridors and hallways at all out side corners of wood stud/ gypsum partition walls.

B. Wall Protection Coverings:

1. Refer to the drawings for locations.

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Diaper changing stations.

C. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.

B. Section 08 83 00 - Mirrors: Other mirrors.

C. Section 10 21 13.17 - Phenolic Toilet Compartment

D. Section 22 40 00 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 ABBREVIATIONS AND ACRONYMS

A. PETG: Polyethylene Terephthalate Glycol.

B. PPE: Personal Protective Equipment.

1.04 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2018, with Editorial Revision (2021).

F. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

G. ASTM C1036 - Standard Specification for Flat Glass; 2021.

H. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

I. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

J. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.
   2. Bradley Corporation: www.bradleycorp.com/#sle.
   3. Georgia-Pacific Professional: www.gppro.com/#sle.
   4. Kimberly-Clark Corporation: www.kcprofessional.com/#sle.
   5. Substitutions: Section 01 60 00 - Product Requirements.

B. Diaper Changing Stations:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.
   2. Bradley Corporation: www.bradleycorp.com/#sle.
   3. Diaper Deck & Company: www.diaperdeck.com/#sle.
   4. Koala Kare Products: www.koalabear.com/#sle.
   5. Substitutions: 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide five keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Zinc Alloy: Die cast, ASTM B86.

G. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

H. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

I. Adhesive: Two component epoxy type, waterproof.

J. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

K. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

E. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

F. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

2.04 COMMERCIAL TOILET ACCESSORIES

A. TA-1 Toilet Paper Dispenser: Roll-in reserve type, designed to allow for automatic activation of reserve roll when needed, or manual activation by pressing release bar; semi-recessed, stainless steel unit with pivot hinge, tumbler lock.
   1. Products:
      a. Bradley Corporation; Model 5402: www.bradleycorp.com/#sle.
      b. Substitutions: Section01 60 00-Product Requirements.

B. TA-2 Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
   1. Capacity: 525 multi-fold, or 400 multifold minimum.
   2. Products:
      a. Bradley Corporation; Model 250-15: www.bradleycorp.com/#sle
      b. American Specialties, Inc: www.americanspecialties.com/#sle.
      c. Substitutions: Section 01 60 00 - Product Requirements.

C. TA-3 Paper Towel Dispenser: Automatic, roll paper type.
   1. Cover: High-impact plastic, translucent cover.
   2. Paper Discharge: Touchless automatic; sensor operated.
   3. Capacity: 8 inch diameter roll.
   4. Mounting: Surface mounted.
   5. Power: Battery operated.
   6. Refill Indicator: Illuminated refill indicator.
   7. Products:
      a. Bradley Corporation; Model 2494: www.bradleycorp.com/#sle .
      b. Substitutions: Section 01 60 00 - Product Requirements.

D. TA-4 Waste Receptacle: Recessed, stainless steel, seamless lower door for access to container, with tumbler lock, reinforced panel full height of door, push-in self-closing top door, continuously welded bottom pan and seamless exposed flanges.
   1. Liner: Removable seamless stainless steel receptacle.
   2. Minimum capacity: 4 gallons.
   3. Products:
      a. Bradley Corporation; Model X: www.bradleycorp.com/#sle
      b. American Specialties, Inc: www.americanspecialties.com/#sle.
      c. Substitutions: Section 01 60 00 - Product Requirements.

E. TA-6 Automated Soap Dispenser: Liquid soap dispenser, wall-mounted, with stainless steel cover and window to gauge soap level, tumbler lock.
   1. Minimum Capacity: 40 ounces.
   2. Products:
      a. Kimberly-Clark Corporation; Model 92145: www.kcprofessional.com/#sle.
      b. Substitutions: Section 01 60 00 - Product Requirements.

F. TA-7 Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: As indicated on drawings.
   3. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
   5. Products:
      a. Bradley Corporation; Model 780 Ange Frame Mirror: www.bradleycorp.com/#sle.
      b. American Specialties, Inc: www.americanspecialties.com/#sle.

c. Substitutions: Section 01 60 00 - Product Requirements.

G. TA-8 Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
1. Minimum capacity: 250 seat covers.
2. Products:
a. Bradley Corporation; Model 5831: www.bradleycorp.com/#sle
b. Substitutions: Section 01 60 00 - Product Requirements.

H. TA-9 Grab Bars: Stainless steel, peened surface.
1. Standard Duty Grab Bars:
a. Push/Pull Point Load: 250 pound-force, minimum.
b. Dimensions: 1-1/2 inch outside diameter, minimum 0.125 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
c. Finish: Satin.
d. Length and Configuration: As indicated on drawings.
e. Products:
1) Bradley Corporation; Model 812-2: www.bradleycorp.com/#sle
2) American Specialties, Inc: www.americanspecialties.com/#sle.
3) Substitutions: Section 01 60 00 - Product Requirements.

I. TA-5 Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
a. Bradley Corporation; Model 4722-15: www.bradleycorp.com/#sle
b. American Specialties, Inc: www.americanspecialties.com/#sle.
c. Substitutions: Section 01 60 00 - Product Requirements.

2.05 DIAPER CHANGING STATIONS

A. TA-13 Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Material: Stainless steel.
2. Mounting: Surface.
3. Color: As selected.
4. Minimum Rated Load: 200 pounds.
5. Products:
a. Substitutions: 01 60 00 - Product Requirements.

2.06 UTILITY ROOM ACCESSORIES

A. TA-14 Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
1. Drying rod: Stainless steel, 1/4 inch diameter.
2. Hooks: Three, 0.06 inch stainless steel rag hooks at shelf front.
3. Mop/broom holders: Four spring-loaded rubber cam holders at shelf front.
4. Length: Manufacturer's standard length for number of holders/hooks.
5. Products:
a. Bradley Corporation; Model 9983: www.bradleycorp.com/#sle
b. American Specialties, Inc: www.americanspecialties.com/#sle.
c. Substitutions: 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. See Section 06 10 00 for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.
   2. Mirrors: 40 inch, measured from floor to bottom of mirrored surface.
   3. Electric Hand Dryers: Measured from floor to bottom of nozzle:
      a. Men: 44 inches.
      b. Women: 42 inches.
      c. Teenager: 41 inches.
      d. Child: 32 inches.
      e. Handicap: 36 inches.
   4. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 21 16 - Gypsum Board Assemblies: Roughed-in wall openings.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. FM (AG) - FM Approval Guide; Current Edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher ratings and classifications, color and finish, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
   2. Ansul, a Tyco Business: www.ansul.com/#sle.
   3. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   4. Nystrom, Inc: www.nystrom.com/#sle.
   5. Larsen's Manufacturing Company: www.larsensmfg.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
   2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
   4. Nystrom, Inc: www.nystrom.com/#sle.
   5. Larsen's Manufacturing Company; Architectural Series: www.larsensmfg.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Cartridge Operated: Spun shell.
   2. Class: A:B:C type.
   3. Size: 20 pound, or as scheduled.
   4. Size and classification as scheduled.
   5. Finish: Baked polyester powder coat, red color.
   6. Temperature range: Minus 65 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Fire Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.

D. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Projected Trim: Returned to wall surface, with 2 inch projection, and 1-3/4 inch wide face.
   3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

E. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

F. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

J. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, to locate unit 48 inches from finished floor to center of door pull.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

3.03 SCHEDULES

A. Refer to drawings for locations of fire extinguisher cabinets and wall mounted fire extinguishers, and the following schedule:
   1. Semi-Recessed Fire Extinguisher Cabinet:
      a. Nystrom, Inc.- Model FC-7022
      b. Activar Construction Products Group, Inc. - JL Industries; Model 1027 C71
      c. Larsen's Manufacturing, Inc.; Model 2409-6R
      d. Substitutions: See Section 01 60 00-Product Requirements.
   2. Fire Extinguishers:
      a. Nystrom, Inc.- Model EX-3010, 10 lb. capacity; UL Rating 4A-80B:C.
      b. Activar Construction Products Group, Inc. - JL Industries;
      c. Larsen's Manufacturing, Inc.; Model MP-10; 10 lb. capacity; UL Rating 4A-80B:C
      d. Substitutions: See Section 01 60 00-Product Requirements.
   3. Wall Mounted Fire Extinguisher: Wall Bracket
      a. Larsen's Manufacturing, Inc.; Standard Bracket Model 546
      b. Substitutions: See Section 01 60 00-Product Requirements

END OF SECTION

SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.02 RELATED REQUIREMENTS

A. Section 11 40 00- Food Service Equipment

B. Section 22 10 05 - Plumbing Piping: Plumbing connections for appliances.

C. Section 26 05 83 - Wiring Connections: Electrical connections for appliances.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00-Allowances, for cash allowances affecting this section.

B. Residential Appliances: Allowance amount covers purchase and delivery but not installation of residential appliances.

1.04 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

C. Gas Appliances: Bearing design certification seal of American Gas Association (AGA).

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator, KA-1: 33-inch wide, free-standing, top mounted freezer, and frost free.
   1. Capacity: Total minimum storage of 21 cu. ft.
   2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
   3. Features: Include glass shelves, light in freezer compartment, and adjustable thermostat.
   4. Exterior Finish: Stainless steel.
   5. Manufacturers:
      a. Maytag; Model MRT311FFFZ

b. Frigidaire Home Products: www.frigidaire.com/#sle.
c. GE Appliances: www.geappliances.com/#sle.
d. Whirlpool Corp: www.whirlpool.com/#sle.
e. Substitutions: See Section 01 60 00-Product Requirements.

C. Cooktop, ____: Natural gas, with standard burners and removable drip pans.
1. Size: 36 inches wide.
2. Elements: 5
3. Features: Include grille module and ____.
4. Exterior Finish: Porcelain enameled steel, color as scheduled.
5. Manufacturers:
a. Frigidaire Home Products; ____: www.frigidaire.com/#sle.
b. GE Appliances; ____: www.geappliances.com/#sle.
c. BOSCH 800 SERIES STAINLESS STEEL HGX8657UC.
d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Microwave (qty 2): Countertop.
1. Capacity: 1.1 cubic ft.
2. Power: 700 watts.
3. Features: Include turntable, cooktop light, night light, and 2-speed exhaust fan.
4. Exterior Finish: Black.
5. Manufacturers:
a. Frigidaire Home Products: www.frigidaire.com/#sle.
b. GE Appliances: www.geappliances.com/#sle.
c. Whirlpool Corp: www.whirlpool.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Waste Disposer: Standard type, overload protection, direct wired, dishwasher connection, drain elbow, drain connector, and sound reduction features.
1. Power: 1/3 HP.
2. Capacity: Large.
3. Height: 14-1/2 inch.
4. Depth: 8-1/2 inch.
5. Splash Guard: Removable.
6. Controls: Wall switch.
7. Voltage: 115 volts, 60 Hz, 4 amps.
8. Sink Flange Kit: Stainless steel.
9. Exterior Finish: Black.
10. Manufacturers:
a. Frigidaire Home Products: www.frigidaire.com/#sle.
b. GE Appliances; GFC32ON: www.geappliances.com/#sle.
c. Whirlpool Corp: www.whirlpool.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Dishwasher, KA-6: Undercounter; 32 inches hight, ADA compliant height for lower counter heights.
1. Controls: Solid state electronic.
2. Wash Levels: Three (3).
3. Cycles: Three (3), including Auto sense, heavy wash and light wash
4. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, adjustable upper rack, and adjustable lower rack.
5. Finish: Stainless steel .
6. Manufacturers:
a. GE Appliances; Model GDT226SSLSS: www.geappliances.com/#sle.
b. Frigidaire Home Products: www.frigidaire.com/#sle.

c. Whirlpool Corp: www.whirlpool.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LAUNDRY APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Clothes Washer and Dryer, Basis of Design, GE Unitized Spacemaker, 3.8 cu. ft. capacity.
1. Size: Large capacity.
2. Controls: Solid state electronic.
3. Cycles: Include normal, permanent press, delicate, soak, and automatic soak.
4. Motor Speed: Single-speed.
5. Features: Include optional second rinse, bleach dispenser, fabric softener dispenser, self-cleaning lint filter, sound insulation, and end of cycle signal.
6. Finish: Painted steel, White

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

3.05 SCHEDULE

A. Refer to the drawings and the following schedule for the location of the residential kitchen and laundry appliances:
1. Riser/ Janitor 105:
a. Stacked Washer/ Dryer
2. Kitchen 109::
a. KA-3: Cooktop
b. KA4: Microwave Oven; counter mounted.
3. Break Room 202:
a. KA-1: Refrigerator/ Freezer
b. KA5: Waste Dispoer
c. KA-6: Undercounter Diswasher.
4. Conference Room 204:
a. KA-2: Undercounter refrigerator

END OF SECTION

SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 12 24 00 - Window Shades

1.03 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 21 00 - Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of concealed blocking to support blinds. See Section 06 10 00.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating physical and dimensional characteristics.

C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

D. Samples: Submit two samples, 4 inch long illustrating slat materials and finish, cord type and color.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Slats: 20 of each type and size.
   3. Extra Lift Cords, Control Cords, and Wands: One of each type.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Horizontal Louver Blinds:
   1. Hunter Douglas Architectural; CD Model: www.hunterdouglasarchitectural.com/#sle.
   2. Levolor; Metal Blinds: www.commercial.levolor.com/#sle.
   3. SWFcontract, a division of Springs Window Fashions, LLC; Bali S3000 Aluminum Blinds: www.swfcontract.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Source Limitations: Furnish blinds and associated controls produced by a single manufacturer and obtained from a single supplier.

2.02 BLINDS

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.

C. Metal Slats: Spring tempered pre-finished aluminum; square slat corners, with manufacturing burrs removed.
   1. Width: 1 inch.
   2. Thickness: 0.008 inch.
   3. Color: As selected by Architect.

D. Slat Support: Woven polypropylene cord, ladder configuration.

E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
   1. Height: 1 x 1-1/2 inches.
   2. Color: Same as slats.

F. Bottom Rail: Pre-finished, formed steel; with end caps.
   1. Color: Same as headrail.

G. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.
   1. Free end weighted.
   2. Color: As selected by Architect.

H. Control Wand: Extruded hollow plastic; hexagonal shape.
   1. Non-removable type.
   2. Length of window opening height less 3 inch.
   3. Color: Clear.

I. Headrail Attachment: Wall brackets.

J. Accessory Hardware: Type recommended by blind manufacturer.

2.03 FABRICATION

A. Determine sizes by field measurement.

B. Fabricate blinds to fit within openings with uniform edge clearance of 1/2 inch.

C. Fabricate blinds to cover window frames completely.

D. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/2 inch between blinds, located at window mullion centers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive the work.

B. Ensure structural blocking and supports are correctly placed. See Section 06 10 00.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.

B. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

A. Adjust blinds for smooth operation.

3.05 CLEANING

A. Clean blind surfaces just prior to occupancy.

3.06 SCHEDULE

A. Provide window blinds at all exterior window openings on the Main Floor Level with the exception of the following rooms and spaces:
   1. Vestibule 101
   2. Multi Room 102
   3. Youth Lounge/ Gameroom 103
      a. Provide window shade system under Section 12 24 00 at glazed folding door system 103B and 103C.
   4. Riser/ Janitor 105
   5. Kitchen 109
   6. Girls Restroom 117
   7. Mens Restroom 118
   8. Teen Gameroom 119
      a. No window covering at overhead glazed door 119C
   9. Teen Maker/ Learning Center 122

B. Provide window blinds at all exterior window openings on the Second Floor Level with the exception of the following rooms and spaces
   1. Corridor 213; Window at stairway.

C. Provide window blinds at the following window openings on the Second Floor Level with the exception of the following rooms and spaces:
   1. Youth Lounge/ Gameroom 103.
      a. Window at wall common with Vestibule 101.
   2. .Office/ Den 107: Two windows

END OF SECTION

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00 - Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2019.

B. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.
   1. Manufacturer's authorized representative.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.09 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
   2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com/#sle.
   3. Levolor: www.commercial.levolor.com/#sle.
   4. SWFcontract, a division of Springs Window Fashions, LLC.; Pro Series Manual Solar Shade System: www.swfcontract.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Interior Roller Shades - Basis of Design: Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
   1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
      a. Drop Position: Regular roll.
      b. Mounting: Window jamb mounted - outside, on face of jambs.
      c. Size: As indicated on drawings.
      d. Fabric: As indicated under Shade Fabric article.
   2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Hardware Type: Mounting end caps with fascia.
   3. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
      a. Material: Extruded aluminum or steel, with wall thickness and material selected by manufacturer.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
      d. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
   4. Hembars: Designed to maintain bottom of shade straight and flat, selected from manufacturer's standard options.

a. Style: Closed pocket; aluminum elliptical slat inside pocket with heat-sealed ends.

5. Manual Operation:
   a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
   b. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 lb minimum breaking strength. Provide upper and lower limit stops.
   c. Shade Lift Assistance: Manufacturer's standard spring device contained in the idler end of roller tube to reduce force required to lift shades; as required based on shade weight.
   d. Chain Retainer:
      1) Chain tensioning device complying with WCMA A100.1.
      2) Manufacturer's standard clip.
   e. Idler Assembly: Molded nylon with adjustable length idler pin or spring-loaded idler to facilitate easy installation and removal of shade for service.
6. Accessories:
   a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; powder coat finish.
      1) Color: Black.
   b. Exposed Headbox: Extruded aluminum, size as required to conceal shade mounting; powder coat finish.
      1) Color: Black.
   c. End Cap Covers: Match fascia or headbox finish.
   d. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

A. Fabric: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Manufacturers:
      a. MechoShade Systems LLC; Soho - 1100 Series (1% open): www.mechoshade.com/#sle.
      b. Mermet Corporation; E-Screen - 1%: www.mermetusa.com/#sle.
      c. Phifer, Inc: www.phifer.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Material: Vinyl coated polyester.
   3. Performance Requirements:
      a. Flammability: Pass NFPA 701 large and small tests.
   4. Color: Charcoal, As selected by Architect from manufacturer’s full range of colors.
   5. Fabrication:
      a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.07 SCHEDULE

A. Provide window shades at the following Main Floor Level exterior window openings:
   1. Youth Lounge/ Gameroom 103:
      a. Provide window shade system at glazed folding door system 103B and 103C.
   2. Teen Game Room 119:
      a. Provide window shade system at aluminum window opening
      b. Provide window shade system at aluminum storefront/ window opening 119B.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Casework.

B. Section 22 40 00 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

D. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

F. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

G. PS 1 - Structural Plywood; 2009 (Revised 2019).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Installation Instructions: Manufacturer's installation instructions and recommendations.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Natural Stone Institute (NSI) Accredited Natural Stone Fabricator; www.naturalstoneinstitute.org/#sle.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Avonite Surfaces: www.avonitesurfaces.com/#sle.
         2) Dupont; Corian: www.corian.com/#sle.
         3) Formica Corporation: www.formica.com/#sle.
         4) LG Hausys America, Inc: www.lghausysusa.com/#sle.
         5) Wilsonart: www.wilsonart.com/#sle.
         6) InPro Corporation; BioPrism Solid Surface: www.inprocorp.com.
         7) Samsung; Staron SOlid Surfaces: www.staron.com.
         8) Substitutions: See Section 01 60 00 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      d. Color and Pattern: As selected by Architect from manufacturer's full line.
   3. Other Components Thickness: 1/2 inch, minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
   5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
   6. Fabricate in accordance with manufacturer's standard requirements.

B. Natural Quartz : Sheet or slab of natural quartz. Basis of Design, One Quartz, Daltile
   1. Flat Sheet Thickness: 1-1/4 inch, minimum.
   2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Dal-Tile Corporation; ONE QUARTZ, NQ69 ASH GREY: www.daltile.com/#sle.
      b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
      c. Finish on Exposed Surfaces: Polished.
   3. Other Components Thickness: 3/4 inch, minimum.
   4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 14 42 00
WHEELCHAIR LIFTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vertical platform wheelchair lift installed in a field-fabricated shaftway.

B. Maintenance contract.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking in framed construction for lift attachment.

B. Section 09 21 16- Gypsum Board Assemblies: Gypsum board shaftway.

C. Division 16- Electrical: Dedicated telephone service and wiring connections.

D. Division 16- Electrical: Lighting and wiring connections at top of shaft.

E. Division 16- Electrical: Electrical power service and wiring connections.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.

D. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts; 2023.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.

G. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

I. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015 (Reapproved 2025).

J. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Errata (2026).

L. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

N. ITS (DIR) - Directory of Listed Products; Current Edition.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of wheelchair lift system with adjacent construction using necessary attachments; provide anchoring devices in accordance with manufacturer's installation instructions; coordinate installation of cast-in-place concrete components.

1. Electrical System: Coordinate utility and electrical system connections to ensure they are made in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Include data on material descriptions, construction details, component dimensions and profiles, and finishes; include data on rated capacities, electrical and operating characteristics, and necessary accessories.
   1. Include complete description of performance and operating characteristics.
   2. Show maximum and average power commands.

C. Shop Drawings: Include plans, elevations, sections, and attachment details; include equipment assembly details with dimensions, weights, loads, required clearances, components, size and location of anchors and required field connections, and methods for field assembly; provide diagrams indicating signal, power, and control wiring.
   1. Incdude wiring diagrams for power, control and signal systems.
   2. Show complete layout and location of equipment, including required clearances and coordination with shaftway.

D. Selection Samples: For each finished product specified, provide two complete sets of color chips representing manufacturer's full range of available color, and patterns.

E. Verification Samples: For each finished product specified, provide two samples,minimum size of 1-3/4 x 2-1/4 -inch, representing actual product, color and patterns.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Maintenance contracts.

I. Executed warranty.

J. Project Record Documents: Accurately record actual locations of concealed items, conduits, and components.

K. Maintenance Materials: Provide the following for Owner's use in maintenance of wheelchair lifts and equipment.
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Provide technical information for servicing operating equipment.
   3. Spare Parts: Provide parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
   4. Provide legible schematic wiring diagrams of installed electrical equipment and changes made to this part of work; list symbols corresponding to identity or markings on wheelchair lifts structural and electrical components.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Provide wheelchair lift design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
   1. Installer to be licensed to install equipment of this scope, with evidence of experience with specified equipment.

D. Documents at Project Site: Maintain at project site one copy of manufacturer's installation instructions, erection drawings, shop drawings, and reference standard documents.

1.07 REGULATORY REQUIREMENTS

A. Provide platform lifts in compliance with:
   1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.

2. ASME A17.1 - Safety Code for Elevators and Escalators.
3. ASME A17.5 - Elevator and Escalator Electrical Equipment.
4. NFPA 70 - National Electric Code.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.09 FIELD CONDITIONS

A. Use of wheelchair lifts during construction for hoisting materials or personnel is not permitted.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty to repair or replace wheelchair lift system components that fail in materials or workmanship. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

D. Extended Warranty: Provide an extended manufacturer’s warranty for the entire warranty period covering the wheelchair lift materials and factory workmanship for the following additional extended period beyond the initial two-year warranty. Preventive Maintenance Agreement required.
   1. One additional year.
   2. Five additional years.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A18.1, ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).

B. Accessibility Requirements: Comply with ADA Standards and ICC A117.1.

C. Structural Performance: Comply with ASCE 7 for loading of wheelchair lift components and assemblies.

D. Perform welding of steel in accordance with AWS D1.1/D1.1M.

E. Perform electrical work in accordance with NFPA 70.

2.02 VERTICAL PLATFORM WHEELCHAIR LIFTS

A. Manufacturers: Basis of Design
   1. SAVARIA, V-1504 Vertical Platform Lift

B. Vertical Platform Wheelchair Lifts: Provide manufacturer's standard type that complies with indicated requirements. Use manufacturer's standard components for vertical platform wheelchair lifts as required for complete system unless otherwise indicated.
   1. Type of Vertical Platform Wheelchair Lift:
      a. Vertical platform wheelchair lift installed within field-fabricated shaftway provided by others; platform includes sidewalls in addition to optional shaftway access doors and frames as indicated on drawings.
   2. Configuration:
      a. Same side for entry/exit, with only front openings.
      b. Number of Stops: Two.
      c. Landing Openings, Self-Closing:
         1) Lower landing with shaftway-mounted door.
         2) Upper landing with enclosure mounted gate.

3. Location:
   a. Interior of building, as indicated on drawings.
4. Lift Load Capacity: 750 lb, maximum.
5. Lifting Height from Bottom to Upper Floor Level: As indicated on drawings.
6. Platform Width Clearance: 42 inches.
7. Platform Length Clearance: 60 inches.
8. Platform Gate: Self-closing and flush-mounted, nominal height of 42 inches with width corresponding to width of platform.
9. Platform Side Wall Panels: Nominal height of 42 inches, with galvanized steel sheet panels, and enclosed within rectangular extruded aluminum framework.
10. Platform Floor: Steel sheet with matte finish, having overall thickness not greater than 1-1/2 inches.
11. Pit Depth: 3 inches.
12. Drive System:
    a. Roller chain hydraulic.
       1) Rated Speed: ___ fpm, nominal.
13. Drive System Enclosure: Provide rectangular galvanized steel tube frame with flush steel sheet panels on sides and top to enclose drive system components; securely attach enclosure to adjacent substrate.

C. Shaftway Wall Components: Prehung, doors mounted flush with inside wall of shaftway provided by others.
   1. Non-Fire-Rated Doors: Extruded aluminum frame and door construction, with 16 gauge, 0.0598 inch galvanized steel sheet lower panel kick plate, and galvanized steel sheet upper panel.
   2. Door Height: 80 inches, at landings indicated.
   3. Door Width: 35-5/8 inches, at landings indicated.
   4. Upper Gate: Extruded aluminum frame with 16 gauge, 0.0598 inch galvanized steel sheet lower panel kick plate, and galvanized steel sheet upper panel.

2.03 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics:
   1. 3 hp.
   2. 15 rated load amperes.
   3. 120 VAC, single-phase, 60 Hz.
   4. Battery Power: _____.

B. Platform Controls: Continuous pressure switch, one for each direction, with keyless operation.

C. Emergency Operation: Provide battery-powered system to raise or lower lift to landing due to malfunction or loss of power.

D. Electrical Components, Boxes, Conduit, Wiring, and Devices: Comply with NFPA 70 and UL (DIR) or ITS (DIR) listed and labeled, and marked as applicable for proposed locations.

2.04 MATERIALS

A. Rolled Steel Sections, Shapes, and Rods: Comply with ASTM A36/A36M.

B. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.

C. Rolled Steel Floor Plates: Comply with ASTM A786/A786M, 1/8 inch thick, with manufacturer's standard surface pattern; rolled from steel plate complying with ASTM A572/A572M, Grade 55 (380).

D. Steel Tubing: Comply with ASTM A500/A500M, cold formed.

E. Anchor Bolts and Rods: Comply with ASTM F1554, Grade 55.

F. Welding: Comply with applicable requirements of AWS D1.1/D1.1M and AWS D1.3/D1.3M.

2.05 EQUIPMENT

A. Lubrication of Equipment: Provide grease fittings for lubricating bearings requiring periodic lubrication, automatic feed type grease cups, and visible and easily accessible lubrication points.

B. Guide Rails, Ropes, Counterweights, Sheaves, Attachment Brackets, and Anchors: Sized in accordance with local building code, including safety factors.

C. Maintenance Devices: Provide as necessary within wheelchair lift system, supported on structural members within accessible locations.

2.06 FINISHES

A. Baked-On Factory Finish for Structural Metal Surfaces: Clean surfaces of rust, oil, or grease and wipe clean with solvent; apply manufacturer's standard two-coat, baked-on finish consisting of primer and thermosetting top coat.
   1. Color: Manufacturer's standard color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that areas and conditions comply with installation tolerances and other conditions affecting this work.

B. Verify that locations for electrical rough-in connections to system equipment are in acceptable locations before installing equipment.

C. Verify that electrical power is available and of correct characteristics.

D. Do not proceed with installation until unacceptable conditions have been corrected.

3.02 PREPARATION

A. Prepare surfaces of substrates using methods in accordance with lift manufacturer's installation instructions.

B. Clean surfaces thoroughly before starting installation of lifts.

3.03 INSTALLATION

A. Install wheelchair lift system and components in accordance with manufacturer's written installation instructions, and in accordance with applicable regulatory requirements including ASME A17.1, and ASME A18.1.

B. Install wheelchair lift system securely to supporting structure, and flush with adjacent surfaces.

C. Install structural components using methods that comply with requirements indicated relative to layout and structural position.

3.04 ADJUSTING

A. Adjust wheelchair lift equipment to operate smoothly and safely.

B. Verify vertical travel of wheelchair lift system; adjust as necessary to maintain operating range indicated.

C. After installation, inspect exposed factory-finished wheelchair lift equipment and repair damaged finishes.

3.05 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove protective coverings from finished surfaces.

C. Clean surfaces and components.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals for closeout submittals.

B. Demonstrate proper operation of wheelchair lifts to Owner's designated representative.

C. Demonstration: Demonstrate operation of wheelchair lift system to Owner's personnel.
   1. Use operation and maintenance data as a reference during the demonstration.
   2. Conduct a walking tour of project.
   3. Briefly describe function, operation, and maintenance of each component.

D. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site.

3.07 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Provide a separate maintenance contract for specified maintenance service.

C. Perform maintenance work using competent personnel under supervision and in direct employment of wheelchair lift installer.

D. Examine monthly; clean, adjust, and lubricate equipment.

E. Repair, or replace parts when required with parts produced by original equipment manufacturer.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

<<<< UPDATE NOTES

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Clearing and grubbing.

B. Selective removal and trimming.

C. Earth stripping and stockpiling.

D. Repair and restoration.

E. Debris removal.

2.02 RELATED REQUIREMENTS

A. Section 02 41 00 - Demolition: Removal of built elements and utilities.

B. Section 31 23 23 - Fill: Material for filling holes, pits, and excavations generated as result of removal operations.

C. Section 32 93 00 - Plants: Relocation of existing trees, shrubs, and other plants; pruning.

2.03 REFERENCE STANDARDS

A. 29 CFR 1910.266 - Logging Operations; Current Edition.

B. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

C. ANSI A300 Part 5 - American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction); 2019.

D. ANSI A300 Part 6 - Tree, Shrub, and Other Woody Plant Management--Standard Practices (Planting and Transplanting); 2012 (Reapproved 2018).

E. ANSI Z133 - American National Standard for Arboricultural Operations - Safety Requirements; 2017.

2.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene prework meeting one week prior to start of work of this section; require attendance by affected personnel.

B. Sequencing: Ensure utility disconnections are in orderly and expeditious manner.

2.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Site Plan:
   1. Indicate vegetation removal limits.
   2. Indicate areas for temporary construction and field offices.

C. Clearing Firm Qualification Statement: Documentation of specialized experience.

2.06 QUALITY ASSURANCE

A. Clearing Firm Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

2.07 FIELD CONDITIONS

A. Ambient Conditions: Terminate work during hazardous environmental conditions according to 29 CFR 1910.266.

B. Existing Conditions: See site and utility survey, existing conditions survey, and site drawing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Comply with additional requirements specified in Section 01 70 00 - Execution and Closeout Requirements.

B. Identify potential runoff areas.

C. Construction Fencing: See Section 01 50 00 - Temporary Facilities and Controls.

3.02 PREPARATION

A. Coordinate work with utility companies; notify before starting work and comply with local requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are to remain.

E. Protect existing vegetation to remain from damage and monitor.

F. Develop dust remediation controls and methods. Do not use water if that results in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

G. Remove preexisting debris, junk, and trash on-site.

3.03 CLEARING AND GRUBBING

A. Clearing: Cut trees, stumps, shrubs, downed timber, and other vegetation for removal within identified area as indicated on drawings according to 29 CFR 1910.266. Follow recommendations of ANSI Z133 and best local practices for species involved.

B. Clear site after relocating vegetation in accordance with ANSI A300 Part 6.

C. Do not remove or damage vegetation 5' beyond the limits of construction, or as determined by the Architect in the field

D. Install substantial, highly visible fences at least 5 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.
   2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
   3. Around other vegetation to remain within vegetation removal limits.
   4. See Section 01 50 00 for fence construction requirements.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum subsoil disturbance.

F. Grubbing: Remove stumps, roots, buried timber, and other vegetation minimum depth 12 inches (30 cm) from ground. Remove rocks minimum depth 6 inches (15 cm) from ground.

3.04 SELECTIVE REMOVAL AND TRIMMING

A. Selective Removal: Individual tree and shrub identified for removal as indicated on drawings according to 29 CFR 1910.266.
   1. Includes trees, stumps, shrubs, downed timber, and other vegetation identified for removal as indicated on drawings.
   2. Fell trees away from vegetation identified to remain.
   3. Pull stumps, remove roots, buried timber, and other vegetation identified for removal 12 inches (30 cm), minimum depth, from ground. Remove rocks 6 inches (15 cm), minimum depth, from ground.
   4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and matching existing grade.

B. Selective Trimming: Individual limbs and branches cut back according to ANSI A300 Part 1 identified for removal as indicated on drawings. Follow recommendations of ANSI Z133 and best local practices for species involved.

3.05 EARTH STRIPPING AND STOCKPILING

A. Stripping:
   1. Remove topsoil within identified area:
   2. Remove topsoil within identified area as indicated on drawings.

B. Stockpiling:
   1. Place topsoil in identified areas as indicated on drawings:
      a. Pile depth not to exceed 8 feet.

3.06 REMOVED VEGETATION PROCESSING

A. Do not burn, bury, landfill, or leave on-site, except as indicated on drawings.

B. Trees: Sell if marketable.

C. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; give preference to on-site uses.

3.07 REPAIR AND RESTORATION

A. Remaining Existing Facilities, Utilities, and Site Features: If damaged due to this work, repair or replace to original condition.

B. Vegetation: Replace damaged or destroyed vegetation identified to remain as indicated on drawings at no cost to Owner:
   1. Outside removal limits.

3.08 DEBRIS REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and windblown debris from public and private lands.

3.09 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.

C. Leave site clean and ready to receive work.

END OF SECTION

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal and storage of topsoil.

B. Rough grading.

C. Fine grading.

D. Replacement and/or provision of topsoil and finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation.

C. Section 31 23 16.26 - Rock Removal.

D. Section 31 23 23 - Fill.

1.03 PRICE AND PAYMENT PROCEDURES

1.04 REFERENCE STANDARDS

A. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

B. Topsoil: Applies to Unit Price F .
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing topsoil, supplying topsoil, stockpiling and placing where required, compacting, and dewatering.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with Town of Pagosa Springs, Public Works Department standards.

1.07 FIELD CONDITIONS

A. Existing Conditions: See site and utility survey and site drawing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel: Excavated on-site.
   1. Graded according to ASTM D2487 Group Symbol GW, GP, or SP.

B. Topsoil: Shall be a friable loam excavated from site or provided as necessary.
   1. Graded.
   2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.

C. Other Fill Materials: See Section 31 23 23.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify survey bench mark and intended elevations for grading areas are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect above- and below-grade utilities to remain.

D. Notify Architects and utility company of any conflicts, to remove and relocate utilities.

E. Provide temporary means and methods to remove standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, and existing structures, from damage by grading equipment and vehicular traffic.

G. Remove topsoil in accordance with Section 31 10 00.

H. Excavate materials in accordance with Section 31 23 16.

I. Remove rock in accordance with Section 31 23 16.26.

J. Fill and backfill in accordance with Section 31 23 23.

K. Protect trees and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

A. Excavate and fill subgrade material to elevations indicated on plans.

B. Remove topsoil from entire site, without mixing with foreign materials.

C. Remove subsoil from areas to be further excavated.

D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content, if to be incorporated in site fills.

E. Benching Slopes: Horizontally bench existing to key fill material to slope for firm bearing.

F. Replace displaced subgrade in accordance with Section 31 23 23.

G. Remove and replace unsuitable materials as specified fill.

3.04 FINE GRADING

A. Scrape and spread subgrade material uniformly smooth and without disruptions as indicated on drawings.

B. Slopes: Transition smoothly to adjacent areas.

C. See Section 31 23 23 for final compaction.

3.05 SOIL REMOVAL AND STOCKPILING

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas designated on site; protect from erosion.

3.06 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth as indicated in the landscape plan.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

E. Place topsoil in areas indicated on landscape plan.

F. Place topsoil where required to level finish grade.

G. Place topsoil during dry weather.

H. Remove roots, weeds, rocks, and foreign material while spreading.

I. Near buildings and trees spread topsoil manually to prevent damage.

J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

K. Lightly compact placed topsoil.

L. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.07 TOLERANCES

A. Top Surface of Finish Grade: Plus or minus 0.05 foot (5/8 inch).

3.08 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Leave site clean and raked, ready to receive work.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for footings, slabs-on-grade, site structures, and utilities within the building.

B. Temporary excavation support and protection systems.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Evaluation Report for 'Ruby Sisson Library Addition' prepared by Western Technologies, Inc. dated March 19, 2024 (Project No. 3129JS012): Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.

C. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; topsoil removal.

D. Section 31 22 00 - Grading: Grading.

E. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

F. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

G. Section 31 23 23 - Fill: Fill materials, backfilling, and compacting.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for excavation.

B. Unit Price A : Excavating Soil Materials.
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating to required elevations, loading and placing materials in stockpile, and dewatering.
   3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

C. See Section 31 23 23 for measurement and payment provisions related to fill.

D. See Section 31 23 16.26 for measurement and payment provisions related to rock removal.

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record drawings at project closeout according to 01 70 00 - Execution and Closeout Requirements. Show locations of installed support materials left in place, including referenced locations and depths, on drawings.

C. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding and Fill to Correct Over-Excavation:
   1. See Section 31 23 23 for bedding and corrective fill materials at general excavations.
   2. See Section 31 23 16.13 for bedding and corrective fill materials at utility trenches.

B. Underground Warning Tapes:
   1. See Section 22 05 53 for underground warning tapes at underground plumbing lines.
   2. See Section 26 05 53 for underground warning tapes at underground electrical lines.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.

C. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by Architect. If the proposed excavation extends more than 1 foot into the prevailing groundwater, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by Geotechnical Engineer.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 10 00 for clearing, grubbing, and topsoil removal.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect trees and other features to remain.

G. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.

3.04 EXCAVATING

A. Excavate to accommodate new structures and construction operations.
   1. Excavate to the specified elevations.
   2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
   3. Cut utility trenches wide enough to allow inspection of installed utilities.
   4. See Section 31 23 16.26 for required excavation clearances for pipes in utility trenches.
   5. Hand trim excavations. Remove loose matter.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 31 23 16.26 for removal of larger material.

E. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.05 SUBGRADE PREPARATION

A. See Section 31 23 23 for subgrade preparation at general excavations.

B. See Section 31 23 16.13 for subgrade preparation at utility trenches.

3.06 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. Install underground warning tape at buried utilities according to Sections 21 05 53, 22 05 53, 23 05 53, and 26 05 53.

C. See Section 31 23 23 for fill, backfill, and compaction requirements at general excavations.

D. See Section 31 23 16.13 for fill, backfill, and compaction requirements at utility trenches.

E. See Section 31 22 00 for rough and fine grading.

3.07 REPAIR

A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.

3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Engineer before placement of foundations.

3.09 CLEANING

A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.

B. Remove excavated material that is unsuitable for re-use from site.

C. Remove excess excavated material from site.

3.10 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 23 16.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document- Geotechnical Evaluation Report for 'Ruby Sisson Library Addition' prepared by Western Technologies, Inc. dated March 19, 2024 (Project No. 3129JS012): Bore hole locations and findings of subsurface materials.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 31 22 00 - Grading: Site grading.

D. Section 31 23 16 - Excavation: Building and foundation excavating.

E. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

F. Section 31 23 23 - Fill: Backfilling at building and foundations.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Unit Price A : Excavating Soil Materials:
   1. Measurement method: By the cubic yard.
   2. Includes: Excavating to required elevations, loading, stockpiling,removing from site, and dewatering.
   3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

C. General Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, supplying fill, placing where required, compacting, and dewatering.

D. Structural Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, supplying fill, placing where required, and compacting.

E. Granular Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, supplying fill, placing where required, compacting, and dewatering.

F. Aggregates:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, supplying fill, placing where required, compacting, and dewatering.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil–Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

G. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. See referenced Western Technologies, Inc. Geotechnical Evaluation Report for fill recommendations.

2.02 ACCESSORIES

A. Geotextile: Non-biodegradable, woven.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Notify Architect and utility company of conflicts.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect trees and other features to remain.

G. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.03 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove lumped subsoil, boulders, and rock up to 1/6 cubic yard measured by volume. See Section 31 23 16.26 for removal of larger material.

H. Remove excavated material that is unsuitable for re-use from site.

I. Stockpile excavated material to be re-used in area designated on site.

J. Remove excess excavated material from site.

K. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

L. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with appropriate fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 6 inches compacted depth; unless otherwise indiced in the Trautner Geotech report.

H. Slope grade away from building as shown on the drawings. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Thrust bearing surfaces: Fill with concrete.
   2. Other areas: Use appropriate fill material for space being filled, compacted as indicated in the Western Technologies, Inc. Geotechnical Evaluation Report.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Compaction density shall be achieved as indicated in Western Technologies, Inc. Geotechnical Evaluation Report.

K. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping:
   1. Bedding: Use native or structural fill, as appropriate. Check with each utility provider.
   2. Cover with general fill.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 8 inch lifts with compaction requirements as indicated in the Trautner Geotech report..

C. At Pipe Culverts:
   1. Bedding: Use structural fill.
   2. Cover with structural fill.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 8 inch lifts with compaction requirements as indicated in the Trautner Geotech report.

D. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile: Section 31 05 19.
   2. Cover drainage fill with general fill, or structural fill as appropriate.
   3. Fill up to subgrade elevation.
   4. Compact as indicated in the Trautner Geotech report.

E. At French Drains:
   1. Use granular fill.
   2. Fill up to 12 inches below finish grade.
   3. Compact as indicated in the Trautner Geotech report.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor") or ASTM D698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: On test per 50 lf of trenching performed, and one test per each road crossing culvert or pipe..

3.09 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 23 16.26
ROCK REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of identified and discovered rock during excavation.

1.02 RELATED REQUIREMENTS

A. Section 31 23 23 - Fill: Fill materials.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00 - Allowances, for description of quantities of site and trench rock removal in cubic yards included in the base bid Contract Sum and adjustment of the allowance.

B. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

C. Site Rock Removal: By the cubic yard measured before removal. Includes preparation of rock for removal, explosive disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

D. Trench Rock Removal: By the cubic yard measured before removal. Includes preparation of rock for removal, explosive disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

1.04 DEFINITIONS

A. Site Rock: Solid mineral material with a volume in excess of 1/3 cubic yard or solid material that cannot be removed with a 3/4 cubic yard capacity power shovel without drilling.

B. Trench Rock: Solid mineral material with a volume in excess of 1/6 cubic yard or solid material that cannot be removed with a 3/4 cubic yard capacity power shovel without drilling.

C. Rock: Solid mineral material of a size that cannot be removed with a 3/4 cubic yard capacity power shovel.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mechanical Disintegration Compound: Grout mix of recommended materials that expand on curing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.03 ROCK REMOVAL

A. It is anticipated that rock excavation will be required in the preparation of the site for the construction of the building foundation and site improvements. The extent and locations of the rock removal cannot be determined in advance.

B. Site rock excavation shall be defined as removal of solid or fractured rock in excess of two (2) cubic yards which requries techniques, such as hammering or jacking for removal. other than those being employed by the Contractor or are normally used such as backhoes, excavators, trenchers, drag lines, etc. If in the opinion of the Engineer, rock excavation is required and the Contractor had in fact made a diligent and determined effort to remove the material using normal excavation procedures as noted, then Site Rock removal shall be per the Contractor's unit price

C. Trench rock shall be similarly defined as boulders in excess of one (1) cubic yard from a utility trench. Should unanticipated rock conditions be encountered, immediatley notify the Engineer and the Owner's Representative. If in the opinion of the Engineer, rock excavation is required and the Contractor had in fact made a diligent and determined effort to remove the material using normal excavation procedures as noted in paragraph B, then Trench Rock removal shall be per the Contractor's unit price.

D. Excavate and remove rock by mechanical methods only; use of explosives is prohibited.

E. Mechanical Methods: Drill holes and utilize expansive tools to fracture rock.

F. Form level bearing at bottom of excavations.

G. Remove shale layers to provide sound and unshattered base for footings.

H. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

I. Remove excavated materials from site.

J. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23.

3.04 FIELD QUALITY CONTROL

A. Independent agency field inspection will be provided under provisions of Section 01 40 00 - Quality Requirements.

B. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

END OF SECTION

SECTION 31 23 23
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for footings, slabs-on-grade, paving, and utilities within the building.

B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Document- Geotechnical Evaluation Report for 'Ruby Sisson Library Addition' prepared by Western Technologies, Inc. dated March 19, 2024 (Project No. 3129JS012): Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.

D. Section 31 22 00 - Grading: Site grading.

E. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

F. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

G. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Structural Fill: Applies to Unit Price B .
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2026.

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type A: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

B. Structural Fill: Class 6 aggregate road base, complying with State of Colorado Department of Transportation (CDOT) standard. Refer to geotech report + Plans

C. Concrete for Fill: Lean concrete. Refer to Geotech report for additional recommendations.

D. Granular Fill - Gravel - Fill Type C: Angular crushed washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM C136/C136M, within the following limits:
      a. 2 inch sieve: 100 percent passing.
      b. 1 inch sieve: 95 percent passing.
      c. 3/4 inch sieve: 95 to 100 percent passing.
      d. 5/8 inch sieve: 75 to 100 percent passing.
      e. 3/8 inch sieve: 55 to 85 percent passing.
      f. No. 4 sieve: 35 to 60 percent passing.

E. Sand - Fill Type D: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.
   1. Graded in accordance with ASTM C136/C136M; within the following limits:
      a. 3/8-inch sieve: 100 percent passing.
      b. No. 4 sieve: Refer to Geotech Report for recommendations.

2.02 ACCESSORIES

A. Geotextile: Non-biodegradable, woven.

B. Vapor Retarder: 10 mil thick, polyethylene.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 31 22 00 for additional requirements.

D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

E. Verify structural ability of unsupported walls to support imposed loads by the fill.

F. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:
   1. Compaction density shall be achieved as indicated in Trautner Geotech report.

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill at Building Foundation:
   1. Use Fill Type B.
   2. Maximum depth per lift: 6 inches, compacted.
   3. Compact to minimum 95 percent of maximum dry density.

C. Under Interior Slabs-On-Grade:
   1. Use granular fill.
   2. Depth: 4 inches deep.
   3. Compact to 95 percent of maximum dry density.

D. At Foundation Walls and Footings:
   1. Use general fill.

2. Fill up to subgrade elevation.
3. Compact each lift to 90 percent of maximum dry density.
4. Do not backfill against unsupported foundation walls.
5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Soil Fill Materials:
1. Perform compaction density testing on compacted fill in accordance with ASTM D1556.
2. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor").
3. If tests indicate work does not meet specified requirements, remove work, replace and retest.
4. Frequency of Tests: Compaction tests should be performed on each lift of material placed in areas proposed for support of structural components.
5. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.07 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

1.02 RELATED REQUIREMENTS

A. Document- Geotechnical Evaluation Report for 'Ruby Sisson Library Addition' prepared by Western Technologies, Inc. dated March 19, 2024 (Project No. 3129JS012).

B. Section 31 22 00 - Grading: Preparation of site for base course.

C. Section 31 23 16.13 - Trenching: Compacted fill over utility trenches under base course.

D. Section 31 23 23 - Fill: Topsoil fill at areas adjacent to aggregate base course.

E. Section 31 23 23 - Fill: Compacted fill under base course.

F. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.

G. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices for general requirements applicable to unit prices for earthwork.

B. Coarse Aggregate or Class 2 Aggregate Base Course: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing where required, and compacting.

C. Fine Aggregate or Class 6 Aggregate Base Course: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2026.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

G. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate where directed by Owner.

C. Aggregate Storage, General:
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coarse Aggregate: Coarse aggregate shall meet the material and gradiation specifications for a Class 2 ABC complying with State of Colorado Department of Transportation current standards and geotech report.

B. Medium Aggregate: Medium aggregate shall meet the material and gradiation specifications for a Class 6 ABC complying with State of [Colorado] [Department of Transportation current] standards. Refer to geotech report for additional information.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Spread aggregate over prepared substrate to a total compacted thickness of 8 inches.

B. See drawings for required aggregate thickness under concrete sidewalks, curbs, gutters and aprons, and asphalt paving.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

G. Apply herbicide to finished surface.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 0.04 feet.

C. Variation From Design Elevation: Within 0.02 feet.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938 as appropriate.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade and curb and gutters, asphalt paving, and concrete slabs in drive areas.

3.06 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This specification covers the furnishing of materials used in and the placement of the Asphaltic Concrete Surface Course (ACSC) or Hot Bituminous Pavement (HBP) or Hot Mix Asphalt (HMA). Asphaltic concrete surface course materials shall be placed in accordance with these specifications and in conformity with typical cross-sections or as established by the Owner's Representative in the field.

B. This item assumes that underlying courses have been inspected, tested, and approved by the Owner's Representative, in accordance with these specifications and accompanying plans. Due diligence should be performed in establishing conformance of underlying courses prior to the on-set of ACSC paving operations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt concrete surface course materials shall be composed of a mixture of asphalt cement, aggregate and mineral filler. Asphalt cement shall conform to the requirements of AASHTO and shall be Performance Grade 58-28, 58-22, 64-28, 64-22, or 76-28.

B. Aggregate for the asphaltic concrete surface course shall be uniform quality, composed of clean, hard, durable particles of crushed stone, crushed gravel, natural gravel, or a combination of these materials. The aggregate shall have a percentage of wear of not more than 40 when tested in accordance with the AASHTO or ASTM Standard Test Method for Abrasion of Coarse Aggregate, Los Angeles Machine. The aggregate materials shall not contain clay balls, organic matter, or other deleterious substances and will be non-plastic with a liquid limit less than 25. The fine aggregate shall have a sand equivalent greater than 45. The weighted average loss shall not exceed 10 percent when tested for soundness in a sodium solution, 5 cycles, in accordance with the applicable AASHTO or ASTM Standard Test Method. Excessive fine material shall be wasted before crushing.

C. Coarse aggregate will have not less than 80 percent one sided fracture, by weight of the particles retained on the No. 8, and not less than 70 percent shall have at least two fractured faces. Flat and elongated particles with a ratio of greater than 3 to 1 shall not exceed 10 percent of the total aggregate retained on the No. 8 sieve.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. The Contractor shall submit to the Owner's Representative a job-mix formula, tested by an AASHTO accredited materials testing laboratory for each mixture to be supplied for the project. Mixture designs may be 5 years old, providing recent test data from an accredited laboratory indicates continued compliance of the mixture to the original design. A mixture summary must be submitted yearly to maintain commercial mixture active status. The yearly mixture summary must be prepared by an accredited laboratory and reviewed by a Professional Engineer. Any changes in aggregate or any other material sources requires the development of a new Job-Mix Formula. Review and/or approval by the Owner's Representative, does not relieve the Contractor of the responsibility for adhering to the specifications presented herein, should erroneous or incorrect data not be discovered by the reviewing agencies.

B. The job-mix formula shall be prepared in accordance with the latest Asphalt Institute Design Manual, MS-2 for Marshall Mix Designs, and SP-2 for Superpave Mix Designs, and the design characteristics presented herein.

C. The job-mix formula report from the accredited laboratory shall state the Marshall or Super-pave properties, optimum asphalt content, combined and individual aggregate grading, mixing and placing temperatures, aggregate characteristics, and mineral admixture or liquid anti-strip type and amount. The mixture properties, including air voids, bulk specific gravity, theoretical maximum specific gravity, voids in mineral aggregate, stability, flow, and other applicable properties shall be graphed in such a manner as the effects of variable asphalt content, between a minimum of four different asphalt contents, varying by 0.5 percent each, be plotted.

D. The job-mix formula and related data must be accepted by the Owner's Representative before the commencement of paving operations. Should a change in sources of materials be made, a new job-mix formula shall be required.

E. Job-mix formula's must be prepared, and reviewed by a State of Colorado Registered Professional Engineer, within one year of paving operations. Should the job-mix formula be greater than one year old, the Contractor may present a mixture summary documenting continued adherence of the mixture to the original design. The mixture summary may consist of a one-point Trial Batch with supporting aggregate data, or a summary of test data accumulated from the previous years mixture testing. The Trial Batch will verify all previous data presented in the original job-mix formula. If the results of aggregate specific gravity tests are within 0.02 of the original job-mix formula, additional aggregate verification tests such as Los Angeles Abrasion and Soundness are not required. However, sand equivalent, gradation, specific gravity and absorption, plasticity, and fractured face tests shall be completed and presented in the Trial Batch report, reviewed by a State of Colorado Registered Professional Engineer.

F. All job-mix formulas shall have a minimum of three individual aggregate materials, with no material constituting more than 50 percent of the aggregate blend.

G. Recycled Asphalt Paving (RAP) may be used as a portion of the job-mix with the following stipulations:

H. RAP will be used at a maximum of 20 percent of the aggregate portion.

I. RAP will be from one source and consist of a stockpile generated from one asphalt paving demolition project, with consistent properties, as determined by an accredited laboratory. Consistent, for the purposes of this specification item purpose, is defined as characteristics of gradation, aggregate durability quality, absorption, and asphalt content, which the job-mix formula design laboratory reasonably determines as consistently definable, to an extent which produces a bituminous mixture which will not be effected, to the extent defined in the production mixture tolerances for gradation or voids characteristics, directly attributable to the RAP.

J. The tested characteristics of the RAP will be presented in the job-mix formula, and include a minimum of 5 extraction gradations, 5 fractured face counts, and other tests determined by the accredited laboratory to be necessary.

K. The following parameters will be utilized in the process of developing job-mix formulas:

Sieve	**Wide Band** 3/4" Grading	1/2" Grading
1"	100	100
3/4"	90- 100	100
1/2"	* (6)	90- 100
#4	* (6)	* (6)
#8	23- 49 (5)	28- 58 (5)
Sieve	3/4" Grading	1/2" Grading
#30	* (4)	* (4)
#200	2- 8 (2)	2- 10 (2)

Bitumen	5.0- 7.0 (3)	5.0- 7.0 (3)
Air Voids	3.0- 5.0	3.0- 5.0
VMA	13 min	14 min
Sieve	3/4" Grading	1/2" Grading
Tensile Strength Ratio	70% min	70% min
Min. Split Tensile Strength	100 psi dry	100 psi dry
Stability (Marshall)	2000 min	2000 min
Flow (Marshall)	8-16	8- 16
Sieve	3/4" Grading	1/2" Grading
Gyrations (N des)	86 (or approved)	86 (or approved)
Marshall Blows	50	50

L. ( ) = Plus or minus tolerance from targets established in job-mix formula for production control. When no parenthesis are provided indicates the production tolerances are the same as design parameters.

M. The production ranges will be based entirely upon the specific targets established in the job-mix formula. However, variation from the job-mix formula targets will be considered, providing the Contractor presents substantiating reason for target changes in a request to the Owners Representative. Changes in design targets must be reviewed by the accredited laboratory which developed the job-mix formula, and an opinion as to the effect in mixture quality provided by the laboratory, with respect to requested changes.

N. In addition to the job-mix formula laboratory data, a one-page design summary will be provided by the accredited laboratory, which presents all design targets indicated above, and all production tolerances based upon the ranges presented above. If production targets are requested to be changed from the design job-mix formula, a revised one-page summary will follow all job-mix formula target change requests to the Owners Representative. **No target changes will be considered on materials, which have already been placed, unless the changes are relative to the initial test strip results.**

2.03 EQUIPMENT

A. Equipment to be used for mixing, hauling, placing and rolling HBP, will be at the discretion of the Contractor, but will comply with applicable State, Federal, and OSHA guidelines, with respect to Safety and Environmental protection.

2.04 MIXING

A. Asphalt cement shall be heated at the mixing plant to the viscosity at which it can be uniformly distributed throughout the mixture, and as denoted in the latest AASHTO, ASTM, or Asphalt Institute temperature/viscosity requirements, or the temperatures recommended by the bitumen supplier. Care shall be exercised to avoid over-heating the asphalt cement materials. Storage tanks shall be equipped with circulating pumps. For liquid anti-stripping agents, adequate and calibrated equipment will be provided at the mixing plant to ensure even and accurate additions.

B. Coarse and fine aggregate shall be handled and stored at the mixing plant in a manner that will prevent segregation of particle size, and intermingling of coarse and fine aggregate. When it is necessary to blend aggregate to achieve the gradation of the job-mix formula, blending shall be accomplished by feeding aggregates from each individual stockpile, through separate bins to the cold elevator feeders. Aggregates shall not be blended in the stockpiles.

C. Aggregates shall be stored in sizes that may be easily recombined into a gradation meeting the requirements of the job-mix formula. Cold aggregates shall be fed carefully to the mixing plant so that surplus and shortages will not occur, and cause breaks in the continuous operation of the plant. The aggregate and asphalt mixture shall be heated to the temperature specified in the job-mix formula.

D. Aggregate storage areas will be prepared in a manner which removes the possibility of retrieving soil or other deleterious materials during the retrieval process.

E. Mixing times shall be established in order to achieve 100 percent coating on all particles. The moisture content of the bituminous mixture shall not exceed 0.3 percent

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SPREADING AND FINISHING

A. No asphalt concrete surface course materials shall be placed until the prime coat application, if required, has fully set and cured before the start of paving operations. The prime coat shall be allowed to cure for a minimum of 24 hours prior to the placement of asphalt concrete materials.

B. HBP shall not be placed on loose or pumping substrate materials. The mixture shall not be placed when weather or surface conditions are such that the material cannot be properly handled, finished or compacted. The surface upon which the mixture is placed shall be reasonably free of moisture at the time such materials are spread. HBP mixtures shall not be placed when the temperature is less than 50 degrees Fahrenheit, in the shade, or when the surface upon which the mixture is to be placed is frozen. The air temperature may be below 50 degrees Fahrenheit when paving, only after the Contractor has demonstrated through the placement of test strips, that consistent compaction can be achieved at the lower temperatures. Such test strips will be placed at designated temperatures, and if successful, those designated temperatures shall be the new standard. If unsuccessful, the test strip shall be allowed to remain in place, providing the surface is acceptable to the Owner's Representative, and no individual compaction test is less than 90 percent. The test strip will be paid for in accordance with the pay factors presented later in this specification.

C. The temperature of the asphaltic concrete surface course mixture, at the time of placement, shall be no more than 20 degrees below the target mixing temperature specified in the job-mix formula. Acceptance of the plant mixed material will be from the windrow, or behind the laydown machine.

D. At locations where the asphalt concrete surface course will abut existing asphalt pavement, the edge of the existing pavement shall be saw cut, to provide a smooth, tight edge. A tack coat of approved asphalt emulsion (SS-1, SS-1H, CSS-1, or CSS-1H) shall be applied evenly, and thoroughly, to all pavement cuts, existing asphalt requiring overlay, cold joints (over 24 hours old), and contact surfaces of concrete gutters and manholes, prior to placing asphalt concrete against them.

E. Asphalt concrete with design finished depths no greater than three inches may be placed in a single lift to provide a nominal compacted thickness. Asphalt concrete with finished depths greater than three inches shall be placed in two lifts, or as approved by the Owner's Representative. Any asphalt layers placed over new asphalt layers within six hours of the previous lift may be done without the use of a complete tack coat, provided the materials have not, at any time, been subject to dust, debris, or water (sweeping is not allowed to subjugate the necessity for tack coating). Placing of asphalt concrete shall be as continuous as possible. Any irregularities which occur shall be corrected before compaction of the mixture.

F. HBP shall be transported and placed in a manner to minimize segregation. Segregated areas behind the paving machine shall be removed immediately at the time of discovery and replaced with fresh material before the initial rolling takes place.

G. Should transverse joints be necessary, such joints shall be formed by cutting back on the previously placed lane to expose the full depth of the course. A coating of tack coat material shall be placed on the contact surface of the joint prior to placement of additional asphalt concrete mixture against the previously placed material.

H. In areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, asphalt concrete material shall be dumped, spread and raked with hand tools to provide the required compacted thickness

3.03 COMPACTION

A. After the HBP has been spread, struck off, and surface irregularities have been adjusted, the mixture shall be thoroughly and uniformly compacted by rolling. The number, weight, and type of rollers furnished by the Contractor shall be sufficient to obtain the required compaction while the asphalt concrete mixture is in a workable condition. The Contractor may use any type of compaction equipment he deems necessary to obtain the specified density, provided a smooth surface free of irregularities, depressions, or roller marks is achieved at the completion of compaction operations. The type of compaction equipment to be used shall be that determined to be best suited to compact the material being placed, and shall be the sole responsibility of the Contractor. However, should even a small amount of surface cracking be evidenced behind the finish roll, the Owner's Representative, reserves the right to require pneumatic compaction be installed somewhere in the roller pattern, to remove mat cracking. If pneumatic compaction is required, or used voluntarily by the Contractor, environmentally safe and non-destructive (to asphalt mat) release agents shall be used on the tires so as to remove tire asphalt fine build-up. Any build-up which does occur shall be removed from the mat surface.

B. Any displacement occurring as a result of reversing the direction of a roller, or from any other causes, shall be corrected immediately by the use of rakes, and the addition of fresh asphalt concrete when required. Serious displacement, not reasonably correctable by hand work, will be removed and replaced. Rollers shall not be allowed to park at any time, on hot asphalt. Care shall be exercised in rolling not to displace the line or grade of the edges of the asphalt concrete mat. Rollers shall not pass over the unprotected edge of freshly placed asphalt.

C. Any mixture that becomes loose, broken, or displaced, or in any way is defective, shall be removed and replaced with fresh asphalt concrete which shall be compacted to conform with the surrounding areas.

D. Unless otherwise directed, rolling shall begin at the sides and proceed longitudinally, parallel to the street centerline. Each pass shall overlap a minimum of ¼ of the previous roller width. Rolling shall progress gradually to the crown of the street. When paving abuts a previously placed lane, the longitudinal joint shall be rolled first, followed by the regular procedure.

E. Rolling shall be continued until all roller marks are eliminated and compacted such that the average of all tests is not less than 92%, nor greater than 96% of the maximum theoretical density, as determined by the AASHTO T-209 test method, and no individual test result should indicate a compaction density less than 90% of the maximum density

3.04 TESTING

A. Commercial Suppliers/Contractors who regularly provide regional mixtures will provide a test strip at the beginning of paving operations yearly. The test strip will be tested with a calibrated (calibrated with core specimens on the mixture/depth tested). The calibration will be performed by obtaining five cores (minimum 4-inch diameter) from the compacted mat, in the same specific test location as performed with the nuclear device. The five cores may be obtained from a combination of projects, if the tonnage on any single project is not sufficient. The density of the cores shall be compared to the nuclear densities and a correlation developed based upon the difference. The core tests shall govern.

B. Test strips shall be performed on every variance of asphalt thickness and accompanying correlation's will be developed. When directed by the Owner's Representative, the Contractor shall core drill or saw cut samples from the compacted pavement for thickness or compaction testing.

C. The amount of control exercised by the Contractor's accredited laboratory in the process of monitoring compaction will be at the discretion of the Contractor. However, the Contractor/Supplier shall provide compaction test results a minimum of once per 500 tons of asphalt placed, on each mixture placed, regardless of the location of placement. The purpose of the testing will be to establish a continuous and consistent pattern of placement and compaction. Accordingly, a minimum of three nuclear density tests shall be performed on each mixture placed, daily. The nuclear density tests shall be performed at random, and may consist of a combination of small projects. Each compaction test shall represent no more than 500 tons of material placed. The Owner or Engineer may request additional compaction testing as necessary. Tests which indicate conformance to the specifications shall be compensated for by the Owner, failing tests shall be compensated for by the Contractor.

D. All lay-down "take-offs" will be monitored by the Contractor, with a ten-foot straight edge. The maximum gap between any contact points of the straight edge will be ¼". The take-offs will be reworked until the gaps between contact points, measured transverse or laterally to centerline, are within the specified tolerance.

E. The straight edge will be periodically placed on the compacted mat in a lateral direction to centerline. Should any typical crowns or dips in the mat be evident in excess of ¼", the lay-down screed or roller pattern will be adjusted such that the crown or dip is removed.

F. MINIMUM TESTING SCHEDULE FOR COMMERCIAL PLANTS AND RANDOM PLACEMENTS

Type of Test	Frequency	Specification
Asphalt Content (nuclear, burn-off, or quantitative)	1/500 tons	± .3% of Target
Gradation (Cold Feed)	1/500 tons	Allowable Deviations provided in Wide Band Table Section 3
Tensile Strength Ratio	1/month	Min 70%, Min 100 psi dry
Air Voids (Marshall or Superpave)	1/week	3.0% to 5.0%
Mat Density (Nuclear)	1/500 tons	92% to 96%

G. Quality Control shall be considered incidental to the cost of asphalt. It is the intent of the quality control portion of this specification to ensure quality on all projects.

3.05 METHOD AND MEASUREMENT OF PAVING

A. Payment for this item shall be made at the contract unit price per ton of Hot Bituminous Pavement installed and accepted. Payment will be made for actual tonnage supplied based on truck tickets. No payment will be made for excessive asphalt placed, or asphalt placed in areas not indicated on the plans or directed by the Owner or Engineer.

B. Separate payment will not be made for furnishing and applying tack coat or furnishing test samples and reconstructing the areas from which they are taken. Separate payment will not be made for furnishing Quality Control/Acceptance testing by the accredited testing laboratory. Separate payment will not be made for patching, and the tonnage for patching has been included in the overall quantity for this item.

C. Payment under this item shall be full compensation for furnishing all materials; mixing, hauling, placing and compacting the asphalt concrete surface course and shall include the costs of all labor, saw-cutting, equipment, storage of materials, and transportation necessary to complete the construction of the Hot Bituminous Layer in accordance with these specifications and accompanying plans. Payment under this item will also be full compensation for any necessary re-shaping and recompacting of the existing, or new Aggregate Surface Course to typical cross section in order comply with the applicable specifications in the overall contract documents

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This specification applies to the furnishing of all labor, materials, forms and equipment required to complete all concrete, cement and steel reinforcement work and related items for sidewalks, curbs, gutters, and aprons as shown on the drawings and specified herein.

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland Cement: Shall conform to ASTM C150 “Specification for Portland Cement” or ASTM C175 “Specifications for Air-Entraining Portland Cement”. Unless otherwise specified Portland cement shall be Type II.

B. Aggregates: Shall meet the requirements of ASTM C33 “Specifications for Concrete Aggregates”. Coarse aggregate shall be composed of sound, durable pieces of crushed stone or gravel, well graded from fine to coarse. Maximum size shall be 1 inch for reinforced work and 1½ inches for non-reinforced. Fine aggregate shall be well graded, clean, sharp and free from organic matter.

C. Coarse and fine aggregates shall be stockpiled, handled and measured separately. Aggregates shall be stockpiled clear of passing vehicles and in such a manner as to avoid segregation or contamination with dust, dirt, leaves or other foreign matter.

D. Water: Shall be clean, fresh and free from injurious amounts of mineral and organic substances.

E. Reinforcing Steel: Shall be deformed bars of intermediate grade with minimum yield point of 60,000 pounds per square inch, conforming to ASTMA615 “Specification for Deformed Billet Steel Bars for Concrete Reinforcement”. Deformation shall be “highbond” type, conforming to ASTM A305. Wire for concrete reinforcement shall conform to ASTM A82 cold drawn steel wire. Welded wire fabric for concrete reinforcement shall conform to ASTM A185. Reinforcing bars are to be free from grease and loose scale.

F. Admixtures: Air-entraining admixtures shall conform to ASTM C260. Water-reducing admixtures, retarding admixtures and accelerating admixtures shall not be used without the prior approval of the Engineer.

G. Pre-formed Expansion Joint Filler: Shall be of bituminous (asphalt or tar) mastic composition conforming to ASTM D994, or other as approved by Architect.

H. Forms: Shall be made of plywood, hard pressed fiberboard, sized and dressed shiplap lumber or metal in which all bolt and rivet holes are countersunk so that a plane smooth surface is obtained. All lumber shall be free from knotholes, loose knots, cracks, splits, warps, and other defects affecting the strength or appearance of the finished structure. All forms shall be free of bulge and warp and shall be cleaned thoroughly before being used a second time.

I. Curing Compound: Curing compound shall be white-pigmented compound conforming to “Specifications for Liquid Membrane Forming Compounds for Curing Concrete", ASTM C309.

J. Fibrous Concrete Reinforcement: Concrete reinforcing fibers shall be 100% virgin polypropylene, collated, fibrillated fibers as supplied by Fibermesh Company, or similar. Reinforcement fibers shall be used in all concrete on this project, using the amount and type in strict accordance with the manufacturer’s recommendations. The fibers shall have a tensile strength of 70 to 100 ksi.

2.02 FORMING

A. Concrete forms shall conform to the shape, lines and dimensions of the members as called for on the drawings. Forms are to be treated with water or oil to reduce water suction from concrete. All plane form surfaces shall be so constructed that the finished concrete surfaces will be true planes free from waves and irregularities. The corners formed by the intersections of plane surfaces shall be filleted or chamfered as appropriate. Forms shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together in such a manner that they will maintain their original positions and shape under superimposed loads and the fluid pressures of the concrete.

B. Forms shall not be removed until the concrete has adequately hardened. No construction load shall be supported upon nor any shoring removed from any part of the structure under construction until the portion of the structure has attained sufficient strength to support safely its weight and the loads placed thereon. The minimum time that shall elapse between the time of placing the concrete and the removal of the forms shall conform to the recommendations of the PCA publication “Design and Control of Concrete Mixtures", Chapter 11.

2.03 STRENGTH, PROPORTIONS AND MIXING:

A. Concrete shall be proportioned and mixed to obtain a minimum compressive strength of 4,500 pounds per square inch at 28 days.

B. Consistency of concrete shall be such as to produce a plastic mix of the workability required at the location where the concrete is to be placed. Recommended slumps are as follows (based on placing without high frequency vibration):
   1. Walls and footings 2” Minimum; 5” Maximum
   2. Slabs 3” Minimum; 5” Maximum

C. When high-frequency vibrators are used, the above values shall be reduced one third.

D. Mix shall contain not less than 6 sacks (94 pounds per sack) of cement per cubic yard of concrete. The water to cement ratio must not exceed 0.48, including water in the aggregate. However, no more water shall be used than necessary to produce a workable mix.

E. Air-entraining agent shall be used in all concrete in such amounts as will effect the entrainment of 6 percent, ±1 percent, of air, by volume, of the concrete as discharged from the mixer. When calcium chloride is being used, the portion of mixing water containing the air-entraining agent shall be introduced separately into the mixer.

F. The use of calcium chloride in concrete will not be allowed for this project.

G. The Contractor shall submit the mix design to the Engineer for review and approval. Only the approved proportions shall be used. These proportions shall be valid only so long as the materials remain the same. Introduction of materials other than those used in the approved mix will require a new mix design. The Engineer will check the concrete during placing for proper workability and placement. He may require such changes as are necessary to achieve satisfactory results.

H. Mixing, if done at the construction site, shall be done in a batch mixer of approved type and capacity for a period not less than 1½ minute after all component materials, including water, are in the drum. During the mixing, the drum shall be operated at drum speeds recommended by the manufacturer and shown on the nameplate on the machine. The entire contents of the mixer shall be removed before materials for a succeeding batch are placed therein. The concrete shall be mixed only in such quantities as are required for immediate use.

I. Ready-mixed concrete (if used) shall be mixed and delivered in accordance with the requirements set forth in “Specifications for Ready-Mixed Concrete” (ASTM C94) and/or as specified herein. Ready mixed concrete shall conform to all requirements of these specifications as to grading of aggregate, strengths, consistency, etc. The Engineer shall have free access to the batching or mixing plant at all times. Ready-mixed concrete shall be continuously mixed from the time the water is added until the time of use.

J. Concrete shall be delivered to the site of the work and discharged from the truck mixer or truck agitator and shall be completed within one hour after the cement comes in contact with the mixing water or with aggregates which are surface wet. In any case, the mixing operation must begin within 30 minutes after the cement has been intermingled with the aggregate. The organization supplying ready mixed concrete shall have sufficient plant and transportation facilities to assure continuous delivery of concrete at the required rate.

K. A delivery ticket shall be prepared for each load of ready-mixed concrete. The truck operator shall hand a copy of each ticket to the Engineer at the time of delivery. Tickets shall show the quantity delivered, the amount of material in the batch, the outdoor temperature in the shade, the time at which the cement was added, and the numerical sequence of delivery.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

3.03 COLD WEATHER CONCRETE WORK

A. Concrete work in cold weather shall conform for the ACI “Recommended Practice for Cold Weather Concreting” (ACI 306).

B. Do not place concrete on frozen ground. Fresh excavation should be covered with straw or other insulating material to prevent the ground from freezing until the concrete can be placed. Remove all ice and frost from forms and steel reinforcement. Contractor shall provide suitable curing temperatures. Maintain temperatures of concrete when using normal Portland cement at 70°F. for three days or 50°F. for five days. Do not allow concrete to freeze during the next four days. Cool concrete gradually at the rate of one to two degrees per hour until it reaches the outside temperature. Concrete placed during freezing weather is done at Contractor’s risk. Any frozen concrete is to be removed at Contractor’s expense

3.04 HOT WEATHER CONCRETE WORK

A. Concrete work in hot weather shall conform to the ACI “Recommended Practice for Hot Weather Concreting” (ACI 305).

B. Use cool materials in preparation of concrete batch. Sprinkle subgrade and wood forms just before placing concrete so they will not absorb water from the mix. Coarse aggregates should be sprinkled before they are added to the batch. Protect against evaporation. Do not delay in placing concrete. Place temporary covers, such as burlap kept continuously wet, over the fresh concrete immediately after striking and darbying. When ready for final finishing, uncover only a small section immediately ahead of the finishers. Cover again at once after final finish and keep cover wet. Start curing as soon as surfaces are hard.

3.05 PLACING CONCRETE

A. Immediately before placing concrete, all surfaces of foundation upon or against which the concrete is to be placed shall be free from standing water, mud and debris. All surfaces shall also be clean and free from oil, objectionable coatings and loose, semidetached, or unsound fragments.

B. Concrete is to be placed in forms immediately upon completion of mixing. The top of all surfaces shall be struck to form a level surface or as otherwise specified. Concrete shall be deposited in continuous layers, the thickness of which generally shall not exceed twenty inches, and drops of more than 4 feet shall be avoided. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling.

C. Concrete shall not be moved laterally in the forms more than 3 feet. Concrete shall be deposited continuously and as rapidly as practicable until the unit of operation is completed. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the space between the bars. No concrete that has partially hardened or been contaminated by foreign matter shall be deposited in the work nor shall re-tempered concrete be used.

D. The temperature of the concrete when it is being placed shall be not more than 90°F and not less than 40°F in moderate weather, or 50°F when the mean daily temperature drops below 40°F.

E. Anchor bolts, castings, steel shapes, sleeves and other materials that are to be embedded in concrete shall be accurately positioned in the forms and securely anchored. Anchor bolts shall have sufficient threads to permit a nut to be installed on the concrete side of the form or template. A second nut shall be installed on the other side of the form or template and the two nuts shall be adjusted so that the bolt will be held rigidly in proper position. Embedment shall be clean when installed.

F. After concrete placement, surfaces not in contact with concrete shall be cleaned of concrete spatter and other foreign substances.

G. Concrete shall be compacted and worked into place by spading, puddling or internal vibration. Care shall be taken in vibrating, spading or puddling concrete to consolidate only to bring a continuous film of mortar to the surface. Consolidation shall stop before any segregation of the concrete occurs. **Vibration for concrete consolidation shall be required for structures with over one foot of concrete, unless an approved super-plasticizer admixture is utilized.**

H. Before depositing new concrete on or against concrete that has set, the existing surface shall be roughened and cleaned. Forms shall be retightened and existing surfaces saturated with water for 24 hours and then slushed with a coat of neat cement.

I. Construction joints shall be used where shown on the drawings or as approved by the Engineer. Care shall be taken in forming keyways so as not to produce thin sections of concrete that can shear off with a slight movement of the sections. Joints shall be straight and neat in appearance. Expansion, contraction and control joints shall be as shown on the plans. Joint materials cast in place must be held in place firmly so they will not be displaced during the concreting. Control joints, where shown, must be cut to the depth required, usually one-fourth to one-third of the thickness of the member

3.06 FINISH

A. Defective concrete, honeycombed areas, voids left by the removal of tie rods, ridges on all concrete surfaces permanently exposed to view or exposed to water on the finished structure shall be repaired immediately after the removal of forms unless otherwise authorized or directed. Voids left by removal of tie rods shall be reamed and completely filled with dry patching mortar. Defective concrete shall be repaired by cutting out the unsatisfactory material and placing new concrete that shall be secured with keys, dovetails, or anchors. Unless otherwise directed on the drawings or elsewhere in the specifications, exposed surfaces, exterior and interior, shall be stone smooth (free of form burrs).

3.07 CURING

A. All concrete, regardless of temperature, weather, or season, shall be protected from premature drying by water curing or by membrane curing. If concrete is cured by water curing, the concrete shall be kept saturated with water for a period of not less than seven days after the concrete is placed, except that where the concrete is being protected from freezing, the time period for concrete saturation shall be one day less than that of the frost protection. Membrane curing of concrete shall be by application of sealing compound. Application of the sealing compound shall be in accordance with the procedures contained in the Bureau of Reclamation “Concrete Manual”. The Engineer must approve Method of concrete saturation.

3.08 SPECIFIC STRUCTURES

A. **Concrete sidewalks** and sidewalk ramps shall be 4 inches thick constructed on a 4-inch layer of ABC compacted to 90% of Modified Proctor (ASTM D-1557) maximum dry density, placed in accordance with the specification entitled “Aggregate Base Course”. The sidewalks shall not be placed until the ABC has been inspected and approved by the Engineer. Sidewalks shall be edged and grooved, with contraction joints ¼ inch wide and 1/3 the depth of the slab, dividing each walk into equal length sections approximately equal to the width of the walk, or as otherwise shown in the details. Sawcut contraction joints shall be 1/8 inch wide, with the other requirements being the same. Expansion joints ½ inch wide shall be placed at no greater than 100-foot intervals and shall be filled to within ½ inch of the surface with pre-formed expansion joint material cut to the required shape. Sidewalks shall have a width as indicated on the plans, unless otherwise designated by the Engineer. Sidewalk access ramps shall be constructed per the construction details in the areas shown on the plans. Individual truncated dome inserts shall be installed as shown on the plans, shall be cast iron inserts with a patina finish, and shall be appropriate for the intended application.

B. **Concrete driveway aprons** shall be 6 inches thick, reinforced as shown on the plans, and shall be constructed on a 6-inch layer of ABC compacted to 95% of Modified Proctor (ASTM D-1557) maximum dry density, placed in accordance with the specification entitled “Aggregate Base Course”. The driveway aprons shall not be placed until the ABC has been inspected and approved by the Engineer. Driveway Aprons shall be edged and grooved, with contraction joints ¼ inch wide and 1/3 the depth of the slab, dividing each into equal length sections approximately equal to the width of the apron, as indicated on the plans, or otherwise designated by the Engineer. Sawcut contraction joints shall be 1/8 inch wide, with the other requirements being the same. No expansion joints shall be positioned transversely within the driveway apron sections. Driveway aprons shall be constructed from top of curb transition to top of curb transition when going from standup to driveway curb and back.

C. **Concrete curb and gutter** (including driveway gutter, valley gutter, and edge curb) shall be reinforced as shown in the plans and constructed on a 6-inch layer of ABC compacted to 95% Modified Proctor (ASTM D-1557) maximum dry density, placed in accordance with the specification entitled “Aggregate Base Course”. The curb and gutter shall not be placed until the ABC has been inspected and approved by the Engineer. Expansion joints shall be located such that curbs and gutters are divided into uniform lengths not to exceed 100 feet. Longitudinal reinforcement shall be discontinuous across expansion joints, with bars terminating 3 inches from the joint on each side. Three smooth and lightly greased No. 4 dowels 24 inches long shall be centered in the slab and over the expansion joint. Form saving devices are acceptable for use across expansion joints. Contraction joints 2 inches deep on the curb and gutter shall be at 10 foot spacing, except where shorter sections are necessary for closures, but no section shall be less than 4 feet long unless approved by the Engineer. Expansion joints shall be ½ inch wide, filled to within ½ inch of the surface with pre-formed expansion joint material cut to the required shape. Pre-formed expansion joint material shall be used to separate new and existing concrete sections. Curb cuts (driveway gutter) for driveways shall be located and placed as shown on plans. Driveway gutter shall be reinforced as indicated on the plans. Valley gutter quantity includes gutter fillets outside of standard curb and gutter section.

D. **Concrete stairs** shall be reinforced and constructed as shown on the plans, including any necessary handrail

E. All of the above sections shall be finished smooth and given a light broom finish, unless otherwise indicated on the plans.

F. All exterior concrete shall have fibrous concrete reinforcement (fibermesh).

3.09 METHOD OF MEASUREMENT AND PAYMENT

A. Payment for concrete sidewalk (including access ramps) shall be made at the contract unit bid price per square foot installed and accepted. Payment for cast iron truncated dome inserts shall be made at the contract unit bid price per square foot installed and accepted. Payment for concrete driveway aprons shall be made at the contract unit bid price per square foot installed and accepted. Payment for standard monolithic curb and gutter shall be made at the contract unit bid price per linear foot installed and accepted. Payment for concrete stairs shall be made at the contract lump sum bid price per stair structure installed and accepted.

B. Payment for items covered under this specification shall be full compensation for all forms, materials, reinforcement, labor, equipment, supplies and transportation necessary to complete the construction of each item in accordance with these specifications and accompanying plans.

C. No separate payment shall be made for rebar, expansion joint materials, joint sealant materials, curing compounds, sawcutting or other work required both for a complete product, and shall be considered subsidiary to the installation, and shall be included in the appropriate contract unit bid price.

D. Any excavations, fills, or disposal of surplus material required for the installation of items covered by this specification shall be included in the contract unit bid price. No separate payment will be made for excavation, fills or disposal of surplus material required for the installation of items covered under this specification.

END OF SECTION

SECTION 32 84 23
UNDERGROUND SPRINKLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings, valves, sprinkler heads, emitters, bubblers, and accessories.

B. Control system.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation: Excavating for irrigation piping.

B. Section 31 23 16.13 - Trenching: Excavating and backfilling for irrigation piping.

C. Section 31 23 23 - Fill: Backfilling for irrigation piping.

1.03 REFERENCE STANDARDS

A. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

B. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

C. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.

D. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with site backfilling, landscape grading and delivery of plant life.

B. Preinstallation Meeting: Convene one week prior to commencing work of this Section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component and control system and wiring diagrams.

C. Shop Drawings: Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, components, plant and landscaping features, site structures, schedule of fittings to be used.

D. Certificate: Certify that products of this section approved by authority having jurisdiction.

E. Operation and Maintenance Data:
   1. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
   2. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.

F. Record Documents: Record actual locations of all concealed components piping system.

G. Maintenance Materials: Provide the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Sprinkler Heads: One of each type and size.
   3. Extra Valve Keys for Manual Valves: One.
   4. Extra Valve Box Keys: One.
   5. Wrenches: One for each type head core and for removing and installing each type head.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.

1.07 WARRANTY/ GUARANTY

A. Contractor shall warrant materials, equipment and workmanship against defects for a period of one year from Date of Substantial Completion.
   1. Settling of backfilled trenches that may occur during guaranty period shall be repaired by the Contractor at no expense to the Owner, including restoration of damaged property.
   2. Owner will maintain turf and planting areas during warranty period, so as not to hamper proper operation of irrigation system.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable code for piping and component requirements.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of products in system.

2.02 IRRIGATION SYSTEM

A. Electric solenoid controlled underground irrigation system, with low point self drain.
   1. Source Power: 120 volt, ____ A., ____ phase.
   2. Low Voltage Controls: 24 volt, ____ A.

B. Manufacturers:
   1. Rain Bird Sales, Inc: www.rainbird.com/#sle.
   2. Toro Company: www.toro.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 PIPE MATERIALS

A. PVC Pipe: ASTM D2241; 200 psi pressure rated upstream from controls, 160 psi downstream; solvent welded sockets.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A); annealed temper.

C. Copper Pipe: ASTM B42, regular type.

D. Fittings: Type and style of connection to match pipe.

E. Pipe Risers at Valves: 160 psi PVC pipe.

F. Solvent Cement: ASTM D2564 for PVC pipe and fittings.

G. Sleeve Material: PVC; Schedule 40 solvent weld.

2.04 OUTLETS

A. Outlets: Brass construction.

B. Rotary Type Sprinkler Head: Fixed type with screens; fully adjustable for flow and pressure; size as indicated; with letter or symbol designating degree of arc and arrow indicating center of spray pattern.

C. Spray Type Sprinkler Head: Fixed surface head.

D. Emitter: Adjustable outlet, non-clogging, with two trickle tubes.

E. Bubbler: Adjustable outlet and _____.

F. Quick Coupler: _____.

2.05 VALVES

A. Gate Valves: Bronze construction; solid wedge, IPS threads, non-rising stem with cross-type operating handle; Nibco T-113-K or similar.

B. Backflow Preventers: Iron body construction, double check valve type.

C. Valve Box:

1. Gate Valves, Quick Coupling Valves, Drain Valves, Drip Line Blow-Out Stubs, and Wite Splice or Stub Box:
   a. Carson Industries #910-10 box with #910-4 T Cover.
   b. Rainbird #VB-10RND.
   c. 6-inch round valve boxes are not acceptable.
2. Control Valves (1- inch through 2- inch): Carson Industries #1419-12 box with 1419-4 T cover.
3. Drip Valve Assemblies (1-inch through 2-inch master valves): Carson Industries #1220-12 box with 1220-4 T cover.
4. All 10-inch round, standard regular and jumbo regular valve boxes installed on project shall be manufactured by one company. Mixing of these valve boxes from multiple manufacturers is not acceptable. Valve box and cover shall be colored green.

D. Quick Coupling Valves: Brass two-piece body designed for working pressure of 125 PSI; operable with quick coupler. Equip quick coupler with locking rubber cover.

2.06 CONTROLS

A. Controller: Automatic controller, microprocessor solid state control with visible readout display, temporary override feature to bypass cycle for inclement weather, timer for a 4 station system, programmable for 7 days in quarter hour increments, with automatic start and shutdown.

B. Controller Housing: NEMA EN 10250 Type 3; weatherproof, watertight, with lockable access door.

C. Valves: Electric Solenoid; normally open; hydraulic tubing, including required fittings and accessorieshaving manual flow adjustment and manual operational nut with internal blend.

D. Wire Conductors: Color coded.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify location of existing utilities.

B. Verify that required utilities are available, in proper location, and ready for use.

3.02 PREPARATION

A. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover, and structures.

B. Layout and stake locations of system components.

C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

D. Static Pressure Verification: Contractor shall field verify the static pressure at the project site prior to commencing work or ordering irrigation materials, and submit findings in writing to Owner. If Contractor fails to verify static water pressure prior to commencing work or ordering materials, the Contractor shall assume responsibility for all costs required to make system operational and the costs to replace any damaged landscape material. Damage shall include all required material costs, design costs and plant replacement costs.

3.03 TRENCHING

A. Trench and backfill in accordance with Section 31 23 16.13.

B. Trench to accommodate grade changes and slope to drains.

C. Maintain trenches free of debris, material, or obstructions that may damage pipe.

3.04 INSTALLATION

A. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.

B. Connect to utilities.

C. Set outlets and box covers at finish grade elevations.

D. Provide for thermal movement of components in system.

E. Use threaded nipples for risers to each outlet.

F. Control Wiring:
   1. Low Voltage Wiring: Bury control wiring between controller and electric valves in pressure supply line trneches, strung as close as possible to main pipe line with such wires to be consistently located below and to one side of pipe, or in separate trenches.

G. Mark valves with neoprene valve markers containing locking device. Set valve markers in pipe risers extending from top of valve to finish grade.

H. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00 - Quality Requirements.

B. Prior to backfilling, test system for leakage at main piping to maintain 100 psi pressure for one hour.

C. System is acceptable if no leakage or loss of pressure occurs and system self drains during test period.

3.06 BACKFILLING

A. Provide 3 inch sand cover over piping.

B. Backfill trench and compact to specified subgrade elevation. Protect piping from displacement.

3.07 SYSTEM STARTUP

A. Prepare and start system in accordance with manufacturer's instructions.

B. Adjust control system to achieve time cycles required.

C. Adjust head types for full water coverage as directed.

3.08 CLOSEOUT ACTIVITIES

A. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance data as basis for demonstration.

3.09 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide one complete spring start-up and a fall shutdown by installer, at no extra cost to Owner.

END OF SECTION

SECTION 32 91 19
LANDSCAPE GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Topsoil placement.

B. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 22 00 - Grading.

C. Section 31 23 16 - Excavation.

D. Section 31 23 23 - Fill.

E. Section 32 92 19 - Seeding.

1.03 REFERENCE STANDARDS

A. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

1.04 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

B. Field Quality Control Submittals: Topsoil depth measurements.

1.05 FIELD CONDITIONS

A. Place topsoil during dry weather.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: Topsoil excavated on-site.
   1. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
   2. Acidity Range (pH): 5.5 to 7.5.
   3. Comply with ASTM D2487 Group Symbol OH.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify grading and intended elevations are as indicated on drawings.

B. Verify absence of standing or ponding water.

3.02 PREPARATION

A. Protect site features to remain, including bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs.

B. Protect trees, plants, lawns, rock outcroppings, and other features to remain.

C. Remove debris, roots, branches, stones, in excess of 1/2 inch in size.

D. Scarify surface to depth of 3 inches.

E. Clear site; see Section 31 10 00.

3.03 TOPSOIL PLACEMENT

A. Uniformly distribute and spread topsoil.

B. Place topsoil in areas where seeding and planting as indicated on drawings.

C. Place topsoil to the following compacted thicknesses:

1. Areas Indicated Seeded with Grass: 6 inches.
2. Shrub Beds: 18 inches.
3. Flower Beds: 12 inches.

3.04 FINISH GRADING

A. Maintain profiles and contour of subgrade.

B. Remove roots, weeds, rocks, and foreign material while spreading.

C. Maintain uniform topsoil thickness.

D. Lightly compact placed topsoil.

3.05 TOLERANCES

A. Topsoil Thickness: 1/2 inch plus/minus.

3.06 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove unused topsoil. Grade stockpile area to prevent standing water.

3.07 PROTECTION

A. Protect from stormwater runoff and subsequent construction operations.

B. Do not permit traffic until established.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, mulching and fertilizer.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of subsoil topsoil in preparation for the work of this section.

B. Section 32 91 19 - Landscape Grading: Topsoil placement and finish grading.

1.03 REFERENCE STANDARDS

A. ASTM D7322/D7322M - Standard Test Method for Determination of Erosion Control Product (ECP) Ability to Encourage Seed Germination and Plant Growth Under Bench-Scale Conditions; 2017.

1.04 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer .

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

2.02 SEED MIXTURE

A. Seed Mixture:
   1. Kentucky Blue Grass: 95 percent; 85 percent germination.

B. Ornamental Grass:
   1. Blue Grama Grass
   2. Little Bluestem

2.03 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

2.04 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Recommended for grass, slow release nitrogen, biological materials, and biostimulant materials; genera; non-selective, organic herbicide, of proportion necessary to eliminate deficiencies of topsoil.
   1. Manufacturers:
      a. Scotts Company- Albuquerque, NM; 19-26-5 HD Starter Fertilizer #83584.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

D. Erosion Fabric: Jute matting, open weave.

E. String: Inorganic fiber.

F. Edging: Galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 22 00.

B. Place topsoil in accordance with Section 32 91 19.

C. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 SEEDING

A. Apply seed at a rate of 45 lbs per 1000 sq ft, or as recomended by seed supplier, evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Do not sow immediately following rain, when ground is too dry, or during windy periods.

D. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

F. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.05 PROTECTION

A. Identify seeded areas with stakes and string around area periphery.

B. The Contractor shall erect suitbale signs and barriers as required at important points notifying the public to keep off seeded areas until the grass is well estbalished.

C. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

D. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

E. Secure outside edges and overlaps at 36 inch intervals with stakes.

F. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

G. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.06 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

C. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

D. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

E. Neatly trim edges and hand clip where necessary.

F. Immediately remove clippings after mowing and trimming.

G. Water to prevent grass and soil from drying out.

H. Roll surface to remove minor depressions or irregularities.

I. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

J. Immediately reseed areas that show bare spots.

K. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 32 93 00
PLANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Topsoil bedding.

C. New trees, plants, and ground cover.

D. Relocated trees, plants, and ground cover.

E. Mulch and Fertilizer.

F. Maintenance.

G. Tree Pruning.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Topsoil material.

B. Section 31 23 23 - Fill: Topsoil material.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

B. Plants: Living trees, plants, and ground cover specified in this Section , and described in ANSI Z60.1.

1.04 REFERENCE STANDARDS

A. Associated Landscape Contractors of Colorado Guide for Colorado Landscape Industry Contracts and Specifications, current edition.

B. Colorado Nursery Act- Title 35, Article 26, Section III, CRS 1973.

C. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

D. ANSI/AHIA Z60.2 - American Standard for Nursery Stock; 2025.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Certificate: Certify fertilizer and herbicide mixture approval by authority having jurisdiction.

C. Maintenance Data: Include cutting and trimming method ; types, application frequency, and recommended coverage of fertilizer .

D. Submit list of plant life sources.

E. Maintenance Contract.

1.06 QUALITY ASSURANCE

A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years documented experience.

B. Installer Qualifications: Company specializing in installing and planting the plants with three years experience.

C. Maintenance Services: Performed by installer.

D. Non-native, Invasive Plant Species: Do not introduce, grow, or cultivate plant species that are non-native to the ecosystem of the project site, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

B. Protect and maintain plant life until planted.

C. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.08 FIELD CONDITIONS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.

B. Do not install plant life when wind velocity exceeds 30 mph.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide one year warranty.

C. Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.

D. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of plants, fertilizer and herbicide mixture.

2.02 PLANTS

A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

2.03 SOIL MATERIALS

A. Topsoil: Imported.

B. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.

2.04 SOIL AMENDMENT MATERIALS

A. Fertilizer: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis. Planting tablets shall be tightly compressed, long lasting, sklow releas and available in 5 and 21 gram sizes.
   1. Scotts Company- Albuquerque, NM; 20-10-5 Agriform Planting Tablets.
   2. Substitutions: See Section 01 60 00-Product Requirements.

B. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 90 percent organic material measured by oven dry weight, pH range of 4.5 to 6; moisture content of 30 percent.

C. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants.

D. Herbicide: Elanco Products Company; Treflan 5G Pre-Emergent Herbicide.

2.05 MULCH MATERIALS

A. Mulching Material: Red cedar species wood shavings, free of growth or germination inhibiting ingredients.
   1. '100% all natural 'Western Red Cedar Premium Mulch'.

2. 'Shredded Red Cedar Mulch', assupplied by Mountain West Prodcuts, Rexburg, ID.

2.06 ACCESSORIES

A. Wrapping Materials: Burlap.

B. Stakes: Softwood lumber, pointed end.

C. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

D. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.

E. Erosion Control Fabric: Excelsior blanket consisting of a uniform 10 mm thick, machine-made mat of curled wood excelsior with 80 percent of the fibers 6 inches or longer in length. The top and bottom of each blanket shall be covered with a biodegradable cotton netting with a maximum of 1/2 x 1/2 inch opening size.
   1. Excel S-2 All Natural, double net excelsior blanket as manufactured by Western Excelsior Corp., as supplied by Vance Brothers, Aurora, CO.

F. Weed Barrier Fabric: Reemay; Typar #3301 Landscape Fabric or equivalent. Fabric shall have a minimum weight of 3.0 oz. per sq. yd.

G. Compost: A-1 Organics 'Premium 3' or approved equivalent.

H. Metal Edging: Roll top metal edging, painted standard brown color or approved color.

2.07 TOP SOIL MIX

A. A uniform mixture of 1 part peat and 3 parts topsoil by volume.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared subsoil and planters are ready to receive work.

B. Saturate soil with water to test drainage.

C. Verify that required underground utilities are available, in proper location, and ready for use.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 3 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds 6 inches larger than plant root system.

3.03 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches over area to be planted. Rake smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches.

3.04 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2 inches of topsoil.

D. Lightly water to aid the dissipation of fertilizer.

3.05 PLANTING

A. Place plants for best appearance.

B. Set plants vertical.

C. Remove non-biodegradable root containers.

D. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth of 6 inches under each plant. Remove burlap, ropes, and wires, from the root ball.

E. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

F. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.06 PLANT RELOCATION AND RE-PLANTING

A. Relocate plants as indicated by Architect.

B. Replant plants in pits or beds, partly filled with prepared topsoil mixture, at a minimum depth of 6 inches under each plant. Remove burlap, ropes, and wires, from the root ball.

C. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch layers. Maintain plant materials in vertical position.

D. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.07 INSTALLATION OF ACCESSORIES

A. Place decorative cover and membrane, where indicated on drawings.

B. Wrap deciduous shade and flowering tree trunks and place tree protectors.

3.08 PLANT SUPPORT

A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:
   1. Tree Caliper: 1 inch; Tree Support Method: 1 stake with one tie
   2. Tree Caliper: 1 to 2 inches; Tree Support Method: 2 stakes with two ties
   3. Tree Caliper: 2 to 4 inches; Tree Support Method: 3 guy wires with eye bolts and turn buckles
   4. Tree Caliper: Over 4 inches; Tree Support Method: 4 guy wires with eye bolts and turn buckles

3.09 TREE PRUNING

A. Prune trees as recommended in ANSI A300 Part 1.

B. Prune newly planted trees as required to remove dead, broken, and split branches.

3.10 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.11 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

C. Provide a separate maintenance contract for specified maintenance service.

D. Maintain plant life immediately after placement and until plants are well established and exhibit a vigorous growing condition. Continue maintenance until termination of warranty period.

E. Irrigate sufficiently to saturate root system and prevent soil from drying out.

F. Remove dead or broken branches and treat pruned areas or other wounds.

G. Neatly trim plants where necessary.

H. Immediately remove clippings after trimming.

I. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.

J. Control insect damage and disease. Apply pesticides in accordance with manufacturers instructions.

K. Remedy damage from use of herbicides and pesticides.

L. Replace mulch when deteriorated.

M. Maintain wrappings, guys, turnbuckles, and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.

3.12 SCHEDULE - PLANT LIST

A. Refer to Landscape Plan of the drawings.

END OF SECTION

SECTION 33 01 10.58
DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of site domestic water lines specified in Section 33 14 16.

B. Disinfection of building domestic water piping specified in Section 22 10 05.

C. Testing and reporting results.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Disinfection of building domestic water piping system.

B. Section 33 14 16 - Site Water Utility Distribution Piping.

C. All testing of public water system shall be coordinated with Pagosa Area Water and Sanitation District (PAWSD)

1.03 REFERENCE STANDARDS

A. Pagosa Area Water and Sanitation District (PAWSD) Techical Speciifications

B. AWWA B300 - Hypochlorites; 2024.

C. AWWA B301 - Liquid Chlorine; 2024.

D. AWWA B302 - Ammonium Sulfate; 2023.

E. AWWA B303 - Sodium Chlorite; 2024.

F. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate results comparative to specified requirements.

C. Certificate: From PAWSD and/or Colorado Department of Public Health and Environment (CDOPHE), as appropriate indicating approval of water system.

D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

E. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.

F. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water complies, or fails to comply, with bacterial standards of CDPHE.

1.05 QUALITY ASSURANCE

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State in which the Project is located.

C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, and AWWA B303 Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping system has been cleaned, inspected , and pressure tested as appropriate.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.

B. Provide and attach equipment required to perform the work.

C. Introduce treatment into piping system.

D. Maintain disinfectant in system for 24 hours, or as required.

E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

F. Replace permanent system devices removed for disinfection.

G. Pressure test system as indicated in PAWSD standards. Repair leaks and re-test.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Test samples in accordance with AWWA C651, or as otherwise approved by PAWSD and/or CDPHE.

END OF SECTION

SECTION 33 14 16
SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water pipe for site conveyance lines.

B. Pipe valves.

C. Fire hydrants.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

B. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

1.03 REFERENCE STANDARDS

A. Pagosa Area Water and Sanitation District (PAWSD) Techical Speciifications.

B. AASHTO HB - Standard Specifications for Highway Bridges; 2005, with Errata.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

D. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

G. ASME B18.2.2 - Nuts for General Applications: Machine Screw Nuts; and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series); 2022.

H. ASME B18.5.2.1M - Metric Round Head Short Square Neck Bolts; 2006 (Reaffirmed 2011).

I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

J. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

K. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

M. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

N. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2021.

O. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2020.

P. 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.

Q. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2022.

R. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 2019.

S. ASTM F1807 - Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Cross-Linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing; 2026a.

T. 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; 2024.

U. ASTM F2080 - Standard Specification for Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe and SDR9 Polyethylene of Raised Temperature (PE-RT) Pipe; 2023.

V. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

W. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

X. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges; 2020.

Y. AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger; 2017.

Z. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe; 2020.

AA. AWWA C205 - Cement–Mortar Protective Lining and Coating for Steel Water Pipe—4 In. (100 mm) and Larger—Shop Applied; 2018.

BB. AWWA C206 - Field Welding of Steel Water Pipe; 2017.

CC. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 in. through 144 in. (100 mm through 3600 mm); 2018.

DD. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings; 2017.

EE. AWWA C209 - Tape Coatings for Steel Water Pipe and Fittings; 2019.

FF. AWWA C210 - Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings; 2015, with Addendum (2020).

GG. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; 2019.

HH. AWWA C502 - Dry-Barrel Fire Hydrants; 2018.

II. AWWA C504 - Rubber-Seated Butterfly Valves; 2015.

JJ. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1,200-mm) NPS; 2017.

KK. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2015.

LL. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances; 2017.

MM. AWWA C602 - Cement-Mortar Lining of Water Pipelines in Place - 4 In. (100 mm) and Larger; 2017.

NN. AWWA C606 - Grooved and Shouldered Joints; 2015.

OO. AWWA C800 - Underground Service Line Valves and Fittings; 2021.

PP. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm); 2016, with Errata (2018).

QQ. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Service; 2020.

RR. AWWA C904 - Cross-Linked Polyethylene (PEX) Pressure Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service; 2016.

SS. AWWA M11 - Steel Pipe - A Guide for Design and Installation; 2016, with Addendum (2019).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with PAWSD Technical Specification requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

B. Protect crosslinked polyethylene tubing from direct and indirect UV exposure.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for materials incorporated in the project.

PART 2 PRODUCTS

2.01 PIPE, APPURTENANCES AND BEDDING

A. Pipe, appurtenances and bedding shall be provided as indicated on the drawings, and in accordance with the PAWSD Technical Specifications.

PART 3 EXECUTION

3.01 EXAMINATION, PREPARATION, TRENCHING AND INSTALLATION

A. All work shall be in accordance with the PAWSD Technical Specificationz.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Pressure test water piping as required by PAWSD.

END OF SECTION

SECTION 33 31 13
SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

1.02 RELATED REQUIREMENTS

A. Pagosa Area Water and Sanitation District (PAWSD) Technical Specifications.

B. Section 31 23 16 - Excavation: Excavating of trenches.

C. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

D. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. Pagosa Area Water and Sanitation District (PAWSD) Technical Specifications.

B. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of sewer with size, location and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

D. Scheduling: Connection of the pressure sewer service shall be coordinated with Harman Park Subdivision.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

E. Field Quality Control Submittals: Document results of field quality control testing.

F. Project Record Documents:
   1. Record location of pipe runs, connections, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 PIPE, APPURTENANCES AND BEDDING

A. Pipe, appurtenances and bedding for both gravity and pressure sewer shall be provided as indicated on the drawings, and covered in the PAWSD Technical Specifications.

PART 3 EXECUTION

3.01 EXAMINATION, PREPARATION, TENCHING AND INSTALLATION

A. All work shall be in accordance with the PAWSD Technical Specifications.

3.02 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 42 11
STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SCOPE

A. This specification covers the furnishing and installation of culvert pipes and necessary fittings to be used in the construction of drainage and ditch culverts. Culverts shall be constructed in accordance with these specifications and in conformity with lines, grades, and slopes as shown on the plans or as established by the Engineer in the field.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation: Excavating of trenches.

B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

C. Section 31 23 23 - Fill: Bedding and backfilling.

D. Section 33 42 30 - Stormwater Drains.

PART 2 PRODUCTS

2.01 STORMWATER PIPE MATERIALS

A. All pipes shall be of the size shown on the plans with the material requirements indicated as follows:

1. **Corrugated Metal Pipe (CMP)** – shall be galvanized, and a minimum thickness of 16 gage. Pipes may be helically or circumferentially corrugated, and shall meet the requirements of AASHTO M 36 except that sawed ends and butt welded joints will be permitted for pipe with helical corrugations formed with continuous lock or welded seams provided all burrs are removed from sawed ends and provided the welds are acceptable.
2. **Poly Vinyl Chloride (PVC)** – shall be SDR 35 PVC bell and spigot pipe with water tight joints. The pipe shall conform to the requirements of ASTM D3034 or ASTM F679 and shall be of the size shown on the plans. Pipe shall be made from quality PVC resin, compounded to provide physical and mechanical properties that equal or exceed cell class 12454 or 12364 as defined in ASTM D1784.
3. High Density Polyethylene (HDPE) – shall be corrugated exterior, smooth interior bell and spigot pipe with water tight joints. The pipe shall conform to the requirements of ASTM F2648, such as ADS N-12 WT or equivalent, and shall be of the size shown on the plans.

B. End sections shall be supplied as indicated on the plans. All end sections shall be galvanized steel. Pipe lengths indicated on the plans do not include the end section length. Damage to pipe or end sections shall be repaired by the contractor prior to acceptance of the installation. Pipe manufacturer recommended couplings, fittings, and joint sealants shall be used on all connections.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of pipe shall be in accordance with the manufacturer's recommendations unless otherwise specified herein or shown on the plans.

B. All CMP shall be laid with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the side. All PVC shall be laid with the bells pointing upstream.

C. Trenches at a minimum shall be of a width to allow for proper jointing and placement and compaction of backfill material. Pipe shall be installed in trenches which have a firm, stable bottom. If the foundation is good firm earth, the trench bottom shall be shaped to give full support to the lower third of the pipe. If the foundation is not good, a layer of fine gravel or other suitable material can be placed in the trench bottom. In any case, the trench bottom along the entire length of the pipe shall be properly graded to assure adequate bearing of the pipe. Recesses shall be made to accommodate pipe bells as required.

D. Each section of pipe shall rest upon the pipe bed for its full length, blocking or wedging will not be permitted. Any pipe that is disturbed after laying shall be taken up and re-laid.

E. The subgrade upon which the pipe is placed shall consist of material suitable for supporting the pipe without excessive settlement or stress development. In the event that rock or excessively spongy or unstable materials are encountered, they shall be removed to a depth of not less than 6 inches below the bottom of the pipe grade and replaced with approved material and mechanically compacted to grade.

F. Damaged pipe ends shall be repaired or removed before placing next to adjacent pipe so that water-tight connection can be made. Damage ends of existing pipes shall be removed to the extent of damage and replaced with pipe of the appropriate diameter. Repair to damaged pipes shall be made per manufacturer recommendations.

G. Preparation of the trench bottom and placement of the pipe shall be carefully made so that, when in final position, the pipe is true to line and grade.

H. Backfill material shall be of the type and quality conforming to that specified for the adjoining fill material and shall be compacted with power tampers to the same density and moisture requirements as specified for adjoining sections of compacted material.

I. After the culvert is in place, backfill material shall be placed and spread in layers not to exceed 4 inches in depth prior to compaction. Backfill over and around the pipe shall be brought up uniformly on all sides in order to avoid distortional stress in the pipe. Particular care shall be taken to thoroughly compact the backfill materials under and around the pipe. Flowfill concrete may be used in lieu of compacted soil. Special care shall be taken when using flowfill not to float the pipe.

J. Culverts shall be so placed that the minimum vertical distance from the finished grade to the top of the pipe shall not be less than 1 foot. The culverts shall be installed with the inverts at the elevations shown on the plans, or such that the inverts of the culvert conform as nearly as possible with the bottom of existing drainage ways

3.02 METHOD OF MEASUREMENT AND PAYMENT

A. Payment for culverts as indicated on the drawings shall be made at the contract bid price.

B. Payment for additional culverts shall be made at the contract unit bid price per lineal foot of pipe installed and accepted. Payment for end sections shall be made at the contract bid price for each end section installed and accepted.

C. Payment under this item shall be full compensation for furnishing and installing culverts and end sections, and shall include the costs of all labor, equipment, materials, and transportation necessary to complete the construction of the culverts in accordance with these specifications and accompanying plans.

D. Any excavations, removal of existing culverts, removal of asphalt or concrete, or use of flowfill concrete for backfill required for the installation of culverts or end sections not covered specifically elsewhere in this Contract shall be considered subsidiary to the installation thereof. No separate payment will be made for excavations, backfill, or flowfill required in the installation of culverts or end sections.

END OF SECTION

SECTION 33 42 30
STORMWATER DRAINS

PART 1 GENERAL

1.01 SCOPE

A. This specification covers the construction of concrete catch basins and associated inlet frame and grate. All catch basins shall be located as indicated on the plans or as established by the Engineer in the field.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation.

B. Section 31 23 23 - Fill.

C. Section 33 42 11 - Stormwater Gravity Piping.

PART 2 PRODUCTS

2.01 MATERIALS

A. The Contractor shall place concrete catch basins as shown in the project construction details. Type II cement shall be used in all concrete. Cast in place structures shall conform to the applicable portions of the specification entitled “Concrete Paving” 32 13 13.

B. Catch basin frame and grates shall be supplied as indicated on the plans. The Contractor shall supply submittals for approval by the Engineer for frames and grates where an “or equal” is being proposed.

C. Shop drawings for any precast structures shall be provided. It may be required to cast-in-place structures to meet exact project elevations and pipe configurations.

D. Type C Inlets shall have a close mesh grate and conform to CDOT Standard M-604-10.

PART 3 EXECUTION

3.01 PREPARATION

A. Excess earth and other undesirable materials shall be excavated and the foundation shall be appropriately prepared. The aggregate base course shall be constructed per the specification entitled “Aggregate Base Courses” 32 11 23.

3.02 INSTALLATION

A. The construction of each structure shall be as shown on the appropriate details in the accompanying drawings. Each structure shall be staked for line and grade prior to construction. Each structure shall be placed over a minimum of 6” of compacted aggregate base course, prepared as indicated above.

3.03 METHOD OF MEASUREMENT AND PAYMENT

A. Payment for inlets with frame and grate as indicated on the drawings shall be made at the contract bid price.

B. Payment for additional inlets with frame and grate shall be made at the contract unit bid price per each inlet installed and accepted. Payment for items covered under this specification shall be full compensation for all forms, materials, reinforcement, labor, equipment, supplies and transportation necessary to complete the construction of each item in accordance with these specifications and accompanying plans.

C. Any excavations, fills. or disposal of surplus material, subgrade preparation, and aggregate base course material required for the installation of items covered by this specification shall be included in the contract bid price. No separate payment will be made for excavation, fills or disposal of surplus material, subgrade preparation, and aggregate base course material required for the installation of items covered under this specification.

END OF SECTION

SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes a complete fire suppression system for the entire building. The system shall include but is not limited to a wet system, valve assemblies, alarms, and all necessary controls. The contractor shall provide design and installation of a complete fire sprinkler system in compliance with NFPA13.

1.2 SYSTEM DESCRIPTION

A. Sprinkler System: Conform to the following criteria:

1. Design system hydraulically to NFPA 13.
2. System performance to achieve the highest hazard classification as determined by the NICET designer.

1.3 SUBMITTALS

A. Shop Drawings: Indicate detailed pipe layout, supports, components, accessories, sizes, and hydraulic calculations.

B. Product Data: Submit data for pipe materials used, valves, manufacturer's catalog sheet for equipment indicating rough-in size, finish, accessories, pump type, capacity, power requirements, certified pump curves, and NPSH.

C. Manufacturer's Certificate: Certify equipment has been tested and meets or exceeds code requirements.

All data for Division 21 must be submitted as a single electronic package as the Engineer will commence review only when all data has been received.

D. The Contractor shall determine and verify field measurements and field construction criteria for conformance with Drawings and Specifications and for conflicts with other items of Construction past or present. He shall coordinate each submittal with the requirements of the Work and of the Contract Documents and notify the Engineer in writing, at the time of the submission, of any and all deviations in the submittals from requirements of the Work and Contract Documents.

No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.

E. Engineer's review does not constitute acceptance or responsibility for accuracy or dimensions, nor shall it relieve the Contractor from meeting any requirements of the Work and Contract Documents, nor shall it constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer by specific written notification for each such variation. The Engineer's review will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of sprinkler heads, piping and sizes, fire riser and equipment.

B. Operation and Maintenance Data: Submit description of components of system, servicing requirements, record drawings, inspection data, and parts lists.

C. Warranties: Provide equipment and contractor warranties.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with:

1. Sprinkler Systems: NFPA 13.

B. Maintain one copy of each document on site.

C. Design fire suppression system under direct supervision of a NICET certified technician experienced in design of this Work and licensed at Project location.

1.6 PERMITS

A. Permits necessary for the performance of the work under this contract shall be secured and paid for by the Contractor. Final inspection by the Engineer will not be made or certificate of final payment issued until certificates of satisfactory inspection from the inspection authorities are delivered.

1.7 TRAINING

A. The contractor shall conduct a 1 hour minimum training session with owner designated staff to review all fire protection equipment installed under this contract. Contractor shall physically demonstrate the operation of each piece of equipment. A sign in sheet and agenda indicating a list of all equipment reviewed shall be included in the close out documents.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1) NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.

1) Sprinkler system design shall be approved by authorities having jurisdiction.

C. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 when required by the building code.

2.2 PIPE AND TUBE

A. Manufacturers:

1. Ansul Incorporated
2. Automatic Sprinkler Corp.
3. Kike Protection Systems
4. Grinnell Corp.
5. Reliable Sprinkler Corp.
6. WSA Inc.
7. Substitutions: Approved equals.

B. Steel Pipe: ASTM A53/A53M, Grade B, ASTM A135, or ASME B36.10M, Schedule 10 or 40 black or galvanized.

1. Steel Fittings: ASME B16.9, wrought steel, butt welded; ASME B16.25, butt weld ends; ASTM A234/A234M, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded.
2. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, threaded type; ASTM A47/A47M.
4. Mechanical Grooved Couplings: Malleable iron housing, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

C. Steel Pipe: ASTM A53/A53M, Grade B, ASTM A135, or ASTM A795 Schedule 5 black.
1. Steel Fittings: Cold drawn steel, mechanically attached, with butylene or EPDM O-ring.

D. Steel Pipe: ASTM A135 Grade A, ULC threadable thin wall, black.
1. Cast Iron Fittings: ASME B16.1, flanges and fittings.
2. Malleable Iron Fittings: ASME B16.3 threaded type.

2.3 GATE VALVES

A. Up to and including 2 inches: Bronze body and trim, rising stem, hand wheel, solid wedge or disc, threaded ends.

B. Over 2 inches: Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.

2.4 CHECK VALVES

A. Up to and including 2 inches: Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2 inches: Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.

C. 4 inches and Over: Iron body, bronze disc with stainless steel spring, resilient seal and threaded, wafer or flanged ends.

2.5 DRAIN VALVES

A. Bronze compression stop with hose thread nipple and cap.

B. Brass ball valve with cap and chain, 3/4 inch hose thread.

2.6 SPRINKLERS

A. Manufacturers:
1. Victaulic
2. Viking
3. Substitutions: Approved Equals.

B. Suspended Ceiling Type: Semi-recessed pendant type with enameled finish, and matching escutcheon.

C. Exposed Area Type: Standard upright type with brass finish.

D. Sidewall Type: Semi-recessed horizontal sidewall type enameled finish with matching escutcheon.

E. Guards: Finish to match sprinkler head.

2.7 SPRINKLER PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: UL 193 Check type valve with electrically or hydraulically operated alarms, with pressure retard chamber and variable pressure trim.

B. Water Motor Alarm: Hydraulically operated impeller type alarm gong, red enameled.

C. Electric Alarm: Electrically operated chrome plated red enameled gong with pressure alarm switch.

D. Water Flow Switch: Vane type switch with two contacts.

2.8 FIRE DEPARTMENT CONNECTION

A. Type: UL 405 Flush mounted wall type with chrome plated finish.

B. Outlets: one way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.

C. Drain: 3/4 inch automatic drip from check valve to outside.

D. Label: "SPRINKLER - FIRE DEPARTMENT" Or “AUTO SPKR & STANDPIPE” or “STANDPIPE” depending on system served.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance NFPA 13, and NFPA 24.

B. Ream pipe and tube ends to full inside diameter. Remove burrs and bevel plain end ferrous pipe.

C. Remove scale and foreign material, inside and outside, before assembly.

D. Install sleeves where penetrating footings, floors, or walls. Seal pipe and sleeve penetration to maintain fire resistance equivalent to fire separation of footings, floors, or walls.

E. Install pipe runs to minimize obstruction to other work. Offset around ductwork.

F. Install piping in concealed spaces above finished ceilings.

G. Install heads to coordinate with reflected ceiling plan.

H. Protection:

1. Apply temporary tape or paper cover to sprinkler heads to protect from painting.

2. Protect concealed sprinkler head cover plates from painting.

I. Hydrostatically test entire system. Schedule test to be witnessed by, authority having jurisdiction.

J. Install sprinklers in suspended ceilings in the center of the narrow dimension of the ceiling panel.

K. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on the ceiling grid.

L. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

3.2 EXISTING SERVICES

A. The Contractor shall carefully examine the drawings and specifications, visit the site of the work, fully inform himself as to all existing conditions, dimensions and limitations before starting work.

B. If existing active or non-active services (which are not shown on plans) are encountered that require relocation or disconnection, the Contractor shall notify the Engineer for a decision on proper handling of these services. The Contractor shall not proceed with the work until so authorized.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Identification for Plumbing Piping and Equipment
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Supports and anchorages.
10. Formed steel channel

1.2 FINAL INSPECTIONS

A. Engineer will make periodic inspections as appropriate and deemed necessary by Engineer. One final inspection for completion of project will be performed by the Engineer. Any and all additional inspections requested by the Contractor or required because of contractor's failure to complete Scope of Work shall be paid for by the Contractor. The cost of additional inspection(s) shall be deducted from the contract amount stated in the agreement between the Owner and the Contractor. Costs for additional inspections shall be assessed at the Engineer’s hourly rates.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

B. Product Data for Pipe and Equipment Identification: Submit for mechanical identification manufacturers catalog literature for each product required.

C. All data for Division 22 must be submitted as a single package as the Engineer will commence review only when all data has been received. Submit shop drawings and product as electronic submittals in accordance with Paragraph D below. Engineer will commence review only when all data has been received in the format required. Incomplete submittals will not be reviewed until the complete package is received.

D. Electronic submittals shall be submitted in the following format:

1. Complete submittals in pdf format will be reviewed by CSI Specification Division
2. All data for Division 22 must be submitted as a single package as the Engineer will commence review only when all data has been received.
3. Submittals linked to a manufacturer's web site will not be reviewed
4. Re-submittals must highlight changes from previous submittals.

E. The Contractor shall determine and verify field measurements and field construction criteria for conformance with Drawings and Specifications and for conflicts with other items of Construction past or present. He shall coordinate each submittal with the requirements of the Work and of the Contract Documents and notify the Engineer in writing, at the time of the submission, of any and all deviations in the submittals from requirements of the Work and Contract Documents.

F. No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.

G. Engineer's review does not constitute acceptance or responsibility for accuracy or dimensions, nor shall it relieve the Contractor from meeting any requirements of the Work and Contract Documents, nor shall it constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer by specific written notification for each such variation. The Engineer's review will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

H. Submit copies of materials for submittal review as required by Division 1.

1.5 PERMITS

A. Permits necessary for the performance of the work under this contract shall be secured and paid for by the Contractor. Final inspection by the Engineer will not be made or certificate of final payment issued until certificates of satisfactory inspection from the inspection authorities are delivered.

1.6 SUBSTITUTIONS

A. Prior approval required. When required by Division 1 of the Specifications, materials and equipment in Division 22 will be reviewed for prior approval. Bidder is required to document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

B. Basis of Design. Equipment/materials indicated in schedules and details shown on the plans form the Basis of Design for this project. Alternate equipment/materials proposed by the contractor must match the specified in dimension, configuration, weight, electrical requirements, etc. Any revision to plans necessary to accommodate the alternate equipment will be the responsibility of the contractor and be reflected in a shop drawing prepared by the contractor and approved by the Engineer.

1.7 MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING

A. The building operations and maintenance documents shall be provided to the owner and shall consist of manufacturers' information, specifications and recommendations; programming procedures and data points; narratives; and other means of illustrating to the owner how the building, equipment and systems are intended to be installed, maintained and operated. Required regular maintenance actions for equipment and

systems shall be clearly stated on a readily visible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

1.8 TRAINING

A. The plumbing contractor shall conduct a training session with owner designated staff to review all plumbing equipment installed under this contract. At a minimum, the session will include operation and maintenance, programming, and basic operation of the systems. Contractor shall physically demonstrate the operation of each piece of equipment. A sign in sheet and agenda indicating a list of all equipment reviewed shall be included in the close out documents.

PART 2 PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.
5. VOC Content: All solvent cements must conform to VOC limits in South Coast Air Quality Management District Rule 1168.

2.3 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

A. All identifications for plumbing piping and equipment shall be installed by the plumbing contractor, not the insulator.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light background color, minimum 1-1/2 inches diameter.

D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener. Color and Lettering: Conform to ASME A13.1. Information to include flow direction and fluid type.

E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Color and Lettering: Conform to ASME A13.1.

F. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

DIELECTRIC FITTINGS

G. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

H. Insulating Material: Suitable for system fluid, pressure, and temperature.

I. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

J. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

K. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

L. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 SLEEVES

A. Sleeves for Pipes Through Non-Fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

2.5 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. Metraflex
2. Garlock Link-Seal, Inc.
3. Substitutions: Permitted

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated or rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated or rough brass.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

2.8 FORMED STEEL CHANNEL

A. Manufacturers:

1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Unistrut Corp.
4. Substitutions: Permitted.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

PART 3 EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs. Provide annular clear space between sleeve and pipe, one inch larger than pipe and scheduled insulation thickness.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

S. Label all piping with fluid type and flow direction. Locate labels within each room. Locate labels so they are readable from an access panel.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.

2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.

3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

5. PVC Non-pressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
1. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.
2. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

K. Plain-End Pipe and Fittings: Use butt fusion.

L. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

E. Label all plumbing equipment including water heaters, pumps, etc. with laminated engraved nameplates.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.7 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.8 EXISTING SERVICES

A. The Contractor shall carefully examine the drawings and specifications, visit the site of the work, fully inform himself as to all existing conditions, dimensions and limitations before starting work.

B. If existing active or non-active services (which are not shown on plans) are encountered that require relocation or disconnection, the Contractor shall notify the Engineer for a decision on proper handling of these services. The Contractor shall not proceed with the work until so authorized.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plumbing piping insulation, jackets and accessories.
2. Plumbing equipment insulation, jackets and accessories.

1.2 SUBMITTALS

A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

B. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index not exceeding 50 in accordance with ASTM E84, UL 723, or NFPA 255.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

1.6 WARRANTY

A. Furnish one year manufacturer warranty for man made fiber.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:

1. CertainTeed.
2. Knauf.
3. Johns Manville.
4. Owens-Corning.
5. Substitutions: Permitted.

2.2 PIPE INSULATION

A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.

1. Thermal Conductivity: 0.23 at 75 degrees F.
2. Operating Temperature Range: 0 to 850 degrees F.
3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
4. Jacket Temperature Limit: minus 20 to 150 degrees F.

2.3 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:

1. ASTM C921 white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

B. PVC Plastic Pipe Jacket:

1. Product Description: ASTM D1784, One piece molded type fitting covers and sheet material, off-white color.
2. Thickness: 15mil.
3. Connections: Brush on welding adhesive or pressure sensitive color matching vinyl tape.

2.4 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Piping Shields: Galvanized steel saddle. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

D. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum or stainless steel jacket single piece construction with self-adhesive closure. Thickness to match pipe insulation.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

G. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

H. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify piping and equipment has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Division 07 for penetrations of assemblies with fire resistance rating greater than one hour.

C. Piping Systems Conveying Fluids Below Ambient Temperature:

1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Hot Piping Systems equal to or less than 140°F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
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.
3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

E. Inserts and Shields:

1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
   a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
   b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

F. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

G. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum or stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

H. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

I. Prepare pipe insulation for finish painting. Refer to Division 09.

3.3 SCHEDULES

A. Water Supply Services Piping Insulation Schedule:

Domestic Hot Water Supply and Recirculation <141Deg.	P-1	1-1/4 inches and smaller 1-1/2 inches and larger	1.0 1.5

Domestic Cold Water <40deg.F.	P-1	3/4 inches and smaller 1 inches and larger	0.5 1.0

END OF SECTION

SECTION 22 10 00

PLUMBING PIPING AND PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Pipe and pipe fittings.
3. Valves.
4. Piping specialties.
5. Plumbing drainage specialties.
6. Plumbing supply specialties.

1.2 SUBMITTALS

A. Product Data:

1. Pipe Hangers and Supports: Submit manufacturers catalog data including load carrying capacity.
2. Pipe and pipe fittings: Submit manufacturers catalog information with sizes, capacities, rough-in requirements, service sizes.
3. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
4. Plumbing drainage specialties: Submit manufacturers catalog information with sizes, capacities, rough-in requirements, service sizes, and finishes.
5. Plumbing supply specialties: Submit manufacturers catalog information with sizes, capacities, rough-in requirements, service sizes, and finishes.
6. Pumps: Include capacities, pump curves, equipment performance, and electrical characteristics.

B. Pipe Hangers and Supports: Design data, indicate pipe sizes, load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit spare parts lists and maintenance procedures.

1.4 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

1.5 WARRANTY

A. Furnish one year manufacturer warranty for pumps.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Carpenter & Paterson Inc.
2. DecoShield Systems Inc.
3. Globe Pipe Hanger Products Inc.

4. Substitutions: Permitted.

B. Conform to ASME B31.9, ASTM F708, MSS SP 58, MSS SP 69 or MSS SP 89.

C. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.

D. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

F. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

G. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

H. Vertical Support: Steel riser clamp.

I. Floor Support for Pipe up to 6 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and supported with either Unistrut, steel pipe, or steel angle mounted to a baseplate of the same material..

J. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

2.2 PIPES AND TUBES

A. Below grade Sanitary Sewer/Vent Piping, Buried Within 5 Feet of Building. All piping and fittings shall be marked with manufacturer’s name, listing agency and size.

1. Cast Iron Pipe: ASTM A74, service weight, with neoprene gaskets or lead and oakum joints.

2. PVC Pipe: ASTM D2665 with PVC fittings and solvent weld joints.

3. PVC Pipe: ASTM D2665 or ASTM F679 with PVC fittings and elastomeric gasket joints.

B. Above grade Sanitary Sewer/Vent Piping, Buried Within 5 Feet of Building. All piping and fittings shall be marked with manufacturer’s name, listing agency and size.

1. Cast Iron Pipe: ASTM A74, service weight, with neoprene gaskets or lead and oakum joints.

2. Cast Iron Pipe: CISPI 301, hubless, service weight, with neoprene gaskets and stainless steel clamps.

3. PVC Pipe: ASTM D2665 with PVC fittings and solvent weld joints. Exception: piping shall not be exposed in a return air plenum.

C. Water Piping, Buried Within 5 Feet of Building:

1. Copper Tubing: ASTM B42, annealed without fittings.

2. Ductile Iron Pipe: AWWA C151 with ductile iron fittings rubber gasket joints and 3/4 inch diameter rods.

3. PEX Tubing: ASTM F877 Cross-Linked Polyethylene, ASTM F1807 for metal insert fittings, ASTM F2159 for copper crimp rings. NSF 14 & 61 compliant.

D. Water Piping, above Grade:

1. Copper Tubing: ASTM B88, Type L, hard drawn, with cast brass or wrought copper fittings and Grade 95TA solder joints. All materials shall be certified by NSF to ANSI/NSF Standard 61 meeting US EPA Lead and Copper Rule.

E. Equipment Drains and Overflows:

1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black steel, malleable iron or forged steel fittings, threaded or welded joints.

2. Copper Tubing: ASTM B88, Type M, hard drawn, cast brass, wrought copper fittings, lead free solder joints.

3. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26, PVC fittings, solvent weld joints.

2.3 VALVES

A. Manufacturers:

1. American Valve
2. Red-White Valve Corp.
3. Milwaukee Valve
4. Substitutions: Permitted.

B. Gate Valves:

1. 3 inches and smaller: Gate valves are not permitted on piping 3” and smaller, use ball valves.
2. Over 3 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, solid wedge, flanged or grooved ends.

C. Ball Valves:

1. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
2. 3 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals and lever handle.
3. Larger than 3 inches: Ball valves are not permitted above 3”, use gate valves.

D. Butterfly Valves:

1. Butterfly valves are not permitted on this project.

E. Swing Check Valves:

1. Up to 2 inches: Bronze body and swing disc, solder or threaded ends.
2. Over 2 inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

F. Relief Valves:

1. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.4 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:

1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.
3. Grooved and Shouldered Pipe End Couplings: Malleable iron housing, C-shape elastomer composition sealing gasket, steel bolts, nuts, and washers.
4. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Strainers:

1. Size 2 inches and Under: Threaded brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
2. Size 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

2.5 PLUMBING DRAINAGE SPECIALTIES

A. Floor Drains:

1. Manufacturers:
   a. Zurn
   b. J.R. Smith
   c. Watts
   d. Substitutions: Permitted
2. Floor Drain: Cast iron body with bottom outlet, combination invertible membrane clamp, adjustable collar with seepage slots, and round polished nickel bronze, light-duty heel-proof strainer.

B. Floor Sinks:
1. Manufacturers:
   a. Zurn
   b. Wade
   c. J.R. Smith
   d. MiFab
   e. Watts
   f. Substitutions: Permitted.
2. Floor Sink: Square lacquered cast iron body with integral seepage pan, epoxy coated interior, strainer, sediment bucket, nickel bronze frame and half grate.

C. Cleanouts:
1. Manufacturers:
   a. Zurn
   b. Wade
   c. J.R. Smith
   d. MiFab
   e. Watts
   f. Substitutions: Permitted.
2. Finished Floor: Lacquered cast iron body with anchor flange, reversible clamping collar, and adjustable nickel-bronze round scored cover in service areas and round depressed cover to accept floor finish in finished floor areas.
3. Wall type: lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.6 PLUMBING SUPPLY SPECIALTIES

A. Backflow Preventers:
1. Manufacturers:
   a. FebCo
   b. Wilkins
   c. Watts
   d. Substitutions: Permitted.
2. Reduced Pressure Backflow Preventers: ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; pressure relief valve located between check valves; third check valve opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

B. Hose Bibbs/Hydrants:

1. Manufacturers:
   a. Woodford
   b. Zurn
   c. Substitutions: Permitted.
2. Wall Hydrant: Non-freeze, self-draining type with chrome plated wall plate lockable recessed box hose thread spout, removable key, and vacuum breaker.

2.7 PLUMBING PUMPS

A. Hot Water Recirculation Pump.
   1. Manufacturers:
      a. Taco
      b. Grundfos
      c. Substitutions: Permitted.
   2. Type: UL listed, NSF 61 certified, inline circulator.
   3. Construction: all materials shall be suitable for open loop potable water systems.
   4. Control: external pipe mounted temperature sensor and internal pump controller for automatic function based on actual hot water use.

B. Condensate Pump.
   1. Manufacturers:
      a. Zoeller
      b. Little Giant
      c. Substitutions: Permitted.
   2. Type: UL listed, plenum rated, with sump, discharge line with check valve
   3. Construction: Flame retardant ABS
   4. Control: float switch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavate.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and dirt, on inside and outside piping before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.
B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

3.4 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.
B. Install unions downstream of valves and at equipment or apparatus connections.
C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Sleeve pipe passing through partitions, walls and floors.

H. Install piping system allowing clearance for installation of insulation and access to valves and fittings.

I. Install identification on piping systems including underground piping. Refer to Section 22 05 00.

J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

K. Install all sanitary vent piping so that all portions of the vent piping will drain by gravity back to the drainage system.

L. Install sway bracing at all changes in direction greater than 45 degrees for pipe sizes 4 inches and larger.

3.5 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install ball or gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves for throttling, bypass, or manual flow control services.

D. Install check valves on discharge of pumps.

E. Install 3/4 inch ball drain valves at low points of piping, and at equipment. Pipe to nearest drain.

F. Install independent ball valves at all hose bibbs.

G. Provide tags on all valves.

3.6 INSTALLATION - PIPING SPECIALTIES

A. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge. Extend nipples and siphons to allow clearance from insulation.

B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

C. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

D. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

E. Provide drain and hose connection with valve on strainer blow down connection.

F. Test backflow preventers in accordance with ASSE.

3.7 INSTALLATION - PLUMBING SUPPLY PIPING

A. Install water piping in accordance with ASME B31.9.

B. Excavate and backfill in accordance with Section 31 20 00.

C. Establish elevations of buried piping outside the building to 12 inches below frost line.

D. Provide support for utility meters in accordance with requirements of utility companies.

E. Slope water piping and arrange to drain at low points.

F. Install piping from relief valves, back-flow preventers and drains to nearest floor drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to washing machine outlets and flush valve assemblies.

H. Provide water service complete with approved reduced pressure back-flow preventer, water meter, and strainer.

I. Install balancing valves in water circulating systems as indicated on Drawings.

J. Disinfecting of Domestic Water Systems:

1. Prior to starting, verify system is complete, flushed and clean.
2. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
3. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.
4. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.
5. Maintain disinfectant in system for 24 hours.
6. When final disinfectant residual tests less than 25 mg/L, repeat treatment.
7. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.
8. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.8 INSTALLATION - PLUMBING DRAINAGE PIPING

A. Install bell and spigot pipe with bell end upstream.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Install with 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. Establish elevations of buried piping outside building to provide not less than 3 ft of cover.

F. Install piping penetrating roofed areas to maintain integrity of roof assembly.

G. Install bell and spigot pipe with bell end upstream.

H. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum. Maintain gradients.

I. Test drainage piping in accordance with local code requirements.

3.9 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Piping supported from above shall be secured to structural elements only. No supports hung from other piping.

C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment.

F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

H. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

I. Support riser piping independently of connected horizontal piping.

J. Provide copper plated hangers and supports for copper piping.

K. Design hangers for pipe movement without disengagement of supported pipe.

L. Prime coat exposed steel hangers and supports. [Refer to Section 09 90 00.] Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

M. Provide sway bracing at changes in direction greater than 45 degrees for pipe sizes 4” and larger.

N. Provide anchorage to restrain piping from axial movement.

3.10 SERVICE CONNECTIONS

A. Install sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and verify proper slope for drainage and proper cover to avoid freezing.

B. Install new water service complete with water meter with by-pass valves. Install sleeve and mechanical sleeve seal in wall for service main and supported at wall, caulked and made watertight. Install sleeve around service main to 6 inch above floor.

3.11 SCHEDULES

A. Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
Cast Iron (All Sizes)	5	5/8
Cast Iron (All Sizes) with 10 foot length of pipe	10	5/8
Copper Tube, 1-1/4 inches and smaller	6	1/2
Copper Tube, 1-1/2 inches and larger	10	1/2
PVC (All Sizes)	4	3/8
Steel, 3 inches and smaller	12	1/2
Steel, 4 inches and larger	12	5/8

END OF SECTION

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water Heaters
2. Thermal Expansion Tanks

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s literature for humidifier

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit literature and parts list.

1.4 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

1.5 WARRANTY

A. Furnish one year manufacturer warranties for all equipment.

PART 2 PRODUCTS

2.1 COMMERCIAL GAS WATER HEATERS

A. Manufacturers:

1. A.O. Smith
2. State
3. Rheem
4. Bradford White
5. Substitutions: Permitted

B. Automatic, natural gas fired, high efficiency, direct vent, vertical storage type:

1. Maximum working pressure: 160 psi.

C. Tanks: Welded steel ASME labeled pressure vessel with submerged combustion chamber with helical heat exchanger coil, glass lined, with ASME rated temperature and pressure relief valve.

D. Controls: Intelligent control system with LCD display providing detailed water heater status, built in diagnostics with run history information, temperature control from 90°F to 181°F, gas pressure regulator, direct spark ignition.

E. Codes and Standards: CSA Certified, ASHRAE/IESNA 90.1, design certified by UL Laboratories to ANSI Z21.10.2-CSA 4.3 Standards and NSF Standard 5.

2.2 THERMAL EXPANSION TANK

A. Manufacturers:

1. Amtrol
2. Taco
3. Bell & Gossett
4. Substitutions: Permitted

B. ASME, steel shell lined tank, for use in potable water systems, maximum working pressure 150 psi, maximum operating temperature 200°F

C. Heavy duty butyl diaphragm, NSF/ANSI 61.

D. Factory precharged to 55 psig.

E. Substitutions: Permitted.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install water heaters in accordance with AGA, NSF and NFPA requirements. Coordinate with plumbing piping and related fuel piping, gas venting and electrical work to achieve operating system.

B. Clean and flush tanks after installation. Keep openings sealed until pipe connections are made.

C. On tanks, install drain at water inlet and outlet, thermometer with range of 40 to 200 degrees F, and ASME pressure relief valve suitable for maximum working pressure.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water closets.
2. Urinals.
3. Lavatories.
4. Sinks.
5. Electric water coolers.
6. Service sinks.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s literature for plumbing fixtures.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit literature and parts list.

1.4 WARRANTY

A. Furnish one year manufacturer warranties for all equipment.

PART 2 PRODUCTS

2.1 FLUSH VALVE WATER CLOSETS

A. Manufacturers:

1. American Standard
2. Kohler
3. Zurn
4. Sloan
5. Gerber
6. Toto
7. Substitutions: Permitted.

B. Bowl: Vitreous china closet, white with elongated rim, 1-1/2 inch spud, china bolt caps.

C. Flush Valve: Exposed, sensor operated, battery powered, mechanical override, chrome plated, escutcheon, and vacuum breaker.

1. Manufacturers:
   a. American Standard
   b. Zurn
   c. Sloan
   d. Toto
   e. Substitutions: Permitted.

D. Seat: Solid white plastic, elongated, open front extended back, brass bolts, without cover.

E. Wall Mounted Carrier: When Wall hung, provide adjustable cast iron frame, integral drain hub and vent, adjustable spud. lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.2 TANK TYPE WATER CLOSETS

A. Manufacturers:

1. American Standard
2. Kohler
3. Crane
4. Zurn
5. Gerber
6. Toto
7. Substitutions: Permitted.

B. Bowl: Floor mounted vitreous china, reverse trap, close-coupled closet combination with regular rim, insulated vitreous china closet tank with fittings and lever flushing valve, chrome plated bolt caps.

C. Seat: Solid white plastic, open front and cover, brass bolts.

2.3 URINALS

A. Manufacturers:

1. American Standard
2. Crane
3. Kohler
4. Zurn
5. Gerber
6. Toto
7. Substitutions: Permitted.

B. Body: A.D.A. compliant, wall mounted vitreous china, flushing rim, siphon jet action and lever flushing valve,.

C. Flush Valve: Exposed, sensor operated, battery powered, mechanical override, chrome plated, escutcheon, and vacuum breaker.

1. Manufacturers:
   a. American Standard
   b. Zurn
   c. Sloan
   d. Toto
   e. Substitutions: Permitted.

D. Wall Mounted Carrier: Floor fastened, adjustable cast iron frame, integral drain hub, lugs for floor and wall attachment.

2.4 LAVATORIES

A. Manufacturers:

1. American Standard
2. Bradley
3. Crane
4. Kohler
5. Zurn
6. Gerber
7. Toto

8. Substitutions: Permitted.

B. Individual Lavatories: A.D.A. compliant, wall mounted vitreous china, front overflow, self draining deck.

C. Group Lavatories: A.D.A compliant, multiple wash stations, solid surface, wall mounted, access panel, stainless steel strainers.

D. Wall Mounted Carrier: Floor fastened, adjustable cast iron frame.

E. Faucets

1. Manufacturers:

a. Chicago Faucets

b. Moen

c. Zurn

d. Sloan

e. T&S Brass

f. Substitutions: Permitted.

2.5 SINKS

A. Manufacturers:

1. Elkay

2. Just

3. Advance Tabco

4. Substitutions: Permitted

B. Faucets

1. Manufacturers:

a. Elkay

b. Moen

c. Delta

d. T & S Brass

2.6 ELECTRIC WATER COOLERS

A. Manufacturers:

1. Elkay

2. Halsey Taylor

3. Oasis

4. Murdock

5. Substitutions: Permitted.

B. Bottle fill: See plans for bottle fill requirements of each electric water cooler.

2.7 SERVICE SINKS

A. Manufacturers:

1. Fiat

2. American Standard

3. Stern Williams

4. Swanstone

5. Florestone

6. Acorn
7. Substitutions: Permitted.

B. Faucets
1. Manufacturers:
a. Chicago
b. Moen
c. Delta
d. Kohler
e. T & S Brass

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adjacent construction is ready to receive rough-in work of this section.

B. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.2 INSTALLATION

A. Install each fixture with chrome plated rigid or flexible supplies with screwdriver stops, reducers, and escutcheons.

B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

C. Install all handicapped accessible water closet flush controls on the open side of the water closet enclosure.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for HVAC Piping and Equipment.
2. Sleeves.
3. Mechanical sleeve seals.
4. Formed steel channel.

1.2 FINAL INSPECTIONS

A. Engineer will make periodic inspections as appropriate and deemed necessary by Engineer. Any and all additional inspections requested by the Contractor or required because of contractor's failure to complete Scope of Work shall be paid for by the Contractor. The cost of additional inspection(s) shall be deducted from the contract amount stated in the agreement between the Owner and the Contractor. Costs for additional inspections shall be assessed at the Engineer’s hourly rates.

1.3 SUBMITTALS

A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

B. Product Data for Pipe and Equipment Identification: Submit for mechanical identification manufacturers catalog literature for each product required.

C. All data for Division 23 must be submitted as a single package as the Engineer will commence review only when all data has been received. Submit shop drawings and product data as electronic submittals in accordance with Paragraph D below. Engineer will commence review only when all data has been received in the format required. Incomplete submittals will not be reviewed until the complete package is received.

D. Electronic submittals shall be submitted in the following format:

1. Complete submittals in pdf format will be reviewed by CSI Specification Division
2. All data for Division 23 must be submitted as a single package as the Engineer will commence review only when all data has been received.
3. Submittals linked to a manufacturer’s web site will not be reviewed
4. Re-submittals must highlight changes from previous submittals.

E. The Contractor shall determine and verify field measurements and field construction criteria for conformance with Drawings and Specifications and for conflicts with other items of Construction past or present. They shall coordinate each submittal with the requirements of the Work and of the Contract Documents and notify the Engineer in writing, at the time of the submission, of any and all deviations in the submittals from requirements of the Work and Contract Documents.

F. No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.

G. Engineer's review does not constitute acceptance or responsibility for accuracy or dimensions, nor shall it relieve the Contractor from meeting any requirements of the Work and Contract Documents, nor shall it constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and

specifically allowed by the Engineer by specific written notification for each such variation. The Engineer's review will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

H. Submit copies of materials for submittal review as required by Division 1.

1.4 PERMITS

A. Permits necessary for the performance of the work under this contract shall be secured and paid for by the Contractor. Final inspection by the Engineer will not be made or certificate of final payment issued until certificates of satisfactory inspection from the inspection authorities are delivered. Reference Division 1 for additional permit requirements.

1.5 SUBSTITUTIONS

A. Prior approval required. When required by Division 1 of the Specifications, materials and equipment in Division 23 will be reviewed for prior approval. Bidder is required to document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

B. Basis of Design. Equipment/materials indicated in schedules and details shown on the plans form the Basis of Design for this project. Alternate equipment/materials proposed by the contractor must match the specified in dimension, configuration, weight, sound levels, electrical requirements, etc. Any revision to plans necessary to accommodate the alternate equipment will be the responsibility of the contractor and be reflected in a shop drawing prepared by the contractor and approved by the Engineer.

1.6 MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING

A. The building operations and maintenance documents shall be provided to the owner and shall consist of manufacturers' information, specifications and recommendations; programming procedures and data points; narratives; and other means of illustrating to the owner how the building, equipment and systems are intended to be installed, maintained and operated. Required regular maintenance actions for equipment and systems shall be clearly stated on a readily visible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

1.7 TRAINING

A. The mechanical contractor shall conduct a 4-hour minimum training session with owner designated staff to review all mechanical equipment installed under this contract. At a minimum, the session will include operation and maintenance, programming, filter change requirements, and basic operation of the systems. Contractor shall physically demonstrate the operation of each piece of equipment. A sign in sheet and agenda indicating a list of all equipment reviewed shall be included in the close out documents.

B. The controls contractor shall conduct a 4-hour minimum training session with owner designated staff to review all building control functions of the BAS installed under this contract. At a minimum, the session will include controls operation, programming, and basic operation of the systems. Contractor shall visually demonstrate the operation of each equipment type on the BAS. A sign in sheet and agenda indicating a list of all equipment reviewed shall be included in the close out documents.

PART 2 PRODUCTS

2.1 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

A. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light background color, minimum 1-1/2 inches diameter.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener. Color and Lettering: Conform to ASME A13.1.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Color and Lettering: Conform to ASME A13.1. Information to include flow direction and fluid type.

E. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. Control Device Labels: Typed labels with adhesive backing. Provide on all control devices (thermostat, occupancy sensor, etc.) to label which unit is controlled by the device.

2.2 SLEEVES

A. Sleeves for Pipes Through Non-Fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves for Round Ductwork: Galvanized steel.

D. Sleeves for Rectangular Ductwork: Galvanized steel.

2.3 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. Metraflex
2. Garlock Link-Seal, Inc.
3. Substitutions: Permitted

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4 FORMED STEEL CHANNEL

A. Manufacturers:

1. Allied Tube & Conduit Corp.
2. B-Line Systems
3. Unistrut Corp.
4. Substitutions: Permitted.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - PIPING AND EQUIPMENT IDENTIFICATION

A. Install plastic nameplates with adhesive.

B. Install plastic tags with corrosion resistant metal chain.

C. Install name plates and labels on all equipment listed in the plans and specifications.

D. Install labels on all pipes showing flow direction and fluid type.

3.3 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel escutcheons at finished surfaces.

3.4 EXISTING SERVICES

A. The Contractor shall carefully examine the drawings and specifications, visit the site of the work, fully inform himself as to all existing conditions, dimensions and limitations before starting work.

B. If existing active or non-active services (which are not shown on plans) are encountered that require relocation or disconnection, the Contractor shall notify the Engineer for a decision on proper handling of these services. The Contractor shall not proceed with the work until so authorized.

3.5 SUBSTANTIAL COMPLETION AND FINAL INSPECTION REQUIREMENTS

A. Before Substantial Completion can be granted, the following items must be completed and submitted to the Owner/Engineer.

1. An approved Test and Balance Report.
2. Factory test reports.
3. Control diagrams, wiring diagrams, control sequences, and engineering data on components.
4. 4-hour training session of owner representative on maintenance, operation and control of all equipment.

B. Prior to the Final Inspection or consideration of Final Payment, the Contractor shall:

1. Provide copies of permits and/or inspection certificates.
2. Provide a Check-out report.
3. Provide Operating and Maintenance Manual(s).
4. Provide equipment warranties.
5. Provide Record as-built Drawings.
6. Return keys to the Owner.
7. Deliver all spare parts.
8. Touch up any damaged finishes.
9. Provide a copy of attendance roster for equipment training sessions.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Testing, adjusting, and balancing of air systems.
2. Testing, adjusting, and balancing of hydronic and domestic hot water systems.

1.2 SUBMITTALS

A. Draft Reports: Submit for review prior to final acceptance of Project.

B. Test Reports: Submit prior to final acceptance of Project and for inclusion in operating and maintenance manuals. Submit as electronic document in pdf format. Include reduced scale drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ASHRAE Standard 111-2018. Procedures for Testing, Adjusting and Balancing, AABC Testing and Balancing Procedures, or NEBB Testing Adjusting and Balancing.

B. Agencies:

1. NEBB. National Environmental Balance Bureau
   a. Certified TAB Supervisor with not less than 5 years of experience in Testing, Adjusting and Balancing.
   b. Certified TAB Technician with not less than 2 years of experience in Testing, Adjusting and Balancing.
2. TABB. Testing, Adjusting and Balancing Bureau.
   a. Certified TAB Supervision. ITI (International Training Institute) tested TAB Technician with not less than 5 years of experience in Testing, Adjusting and Balancing.
   b. Certified TAB Technician. ITI (International Training Institute) tested TAB Technician with not less than 2 years of experience in Testing, Adjusting and Balancing.
3. AABC. American Air Balance Council.
   a. Supervisor-Certified Test and Balance Engineer (TBE) with not less than 5 years of experience in Testing, Adjusting and Balancing.
   b. Technician-Certified Test and Balance Technician with not less than 2 years of experience in Testing, Adjusting and Balancing.
4. Registered Professional Engineer with not less than 5 years of experience in Testing, Adjusting and Balancing.

C. Report Forms: AABC MN-1 National Standards for Total System Balance forms. Forms prepared following ASHRAE 111 or NEBB forms.

PART 2 PRODUCTS

A. Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before starting work, verify systems are complete and operable.

B. Report defects, deficiencies, or abnormal conditions in mechanical systems preventing system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply, return and exhaust systems.

B. Air Outlets and Inlets: Adjust to within plus or minus 10 percent of design.

C. Domestic Water and Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.3 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to deliver design supply, return, and exhaust air quantities within previously stated tolerances.

B. Make air quantity measurements in ducts by traverse of entire cross-sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Use volume control devices to regulate air quantities only to extent those adjustments do not create objectionable air motion or sound levels. Change volume using dampers mounted in ducts.

E. Vary total system air quantities by adjustment of fan speeds. Provide drive changes to accomplish system air flow. Vary branch air quantities by damper regulation.

F. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Allow for pressure drop equivalent to 50 percent loading of filters.

G. Adjust automatic outside air, return air, and exhaust air dampers for design conditions.

H. Measure temperature conditions across outside air, return air, and exhaust air dampers to check leakage.

I. At modulating damper locations, take measurements and balance at extreme conditions.

3.4 WATER SYSTEM PROCEDURE

A. Adjust water systems after air balancing to deliver design quantities within previously stated tolerances.

B. Use calibrated fittings or equipment and pressure gauges to determine flow rates for system balance. Where not installed, base flow balance on temperature difference across heat transfer elements.

C. Change system balance with automatic control valves fully open to heat transfer elements.

D. Change adjustment of water distribution systems by means of balancing cocks, valves, and fittings.

3.5 FIELD QUALITY CONTROL

A. Verify recorded data represents actually measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices. Set and lock memory stops.

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. HVAC piping insulation, jackets and accessories.
2. HVAC ductwork insulation, jackets, and accessories.

1.2 SUBMITTALS

A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

B. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84, UL 723, or NFPA 255.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.6 WARRANTY

A. Furnish one year manufacturer warranty on all products and services.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:

1. CertainTeed.
2. Knauf.
3. Johns Manville.
4. Owens-Corning.
5. Substitutions: Permitted.

B. Manufacturers for Closed Cell Elastomeric Insulation Products:

1. Aeroflex. Aerocell.

2. Armacell, LLC. Armaflex.
3. Nomaco. K-flex.
4. Substitutions: Permitted.

C. Manufacturers for Polyisocyanurate Foam Insulation Products:
1. Dow Chemical Company.
2. Substitutions: Permitted.

D. Manufacturers for Extruded Polystyrene Insulation Products:
1. Dow Chemical Company.
2. Substitutions: Permitted.

2.2 PIPE INSULATION

A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.
1. Thermal Conductivity: based on fluid temperature. See “Schedules” section below.
2. Operating Temperature Range: based on fluid temperature. See “Schedules” section below.
3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
4. Jacket Temperature Limit: based on fluid temperature. See “Schedules” section below.

B. Type P-2: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
1. Thermal Conductivity: based on fluid temperature. See “Schedules” section below.
2. Operating Temperature Range: based on fluid temperature. See “Schedules” section below.

2.3 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Piping Shields: Galvanized steel saddles and inserts not less than 6 inches long, matching thickness and contour of adjoining insulation.

D. Adhesives: Compatible with insulation.

2.4 EQUIPMENT INSULATION

A. TYPE E-8: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.

2.5 EQUIPMENT INSULATION JACKETS

A. Aluminum Equipment Jacket:
1. ASTM B209.
2. Thickness: 0.016inch thick sheet.
3. Finish: Embossed.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.6 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.

1. Thermal Conductivity: 0.25 at 75 degrees F.
2. Maximum Operating Temperature: 250 degrees F.

B. TYPE D-4: ASTM C1071, Type I, flexible, antimicrobial glass fiber duct liner with coated air side.

1. Thermal Conductivity: 0.25 at 75 degrees F.
2. Maximum Operating Temperature: 250 degrees F.
3. Maximum Air Velocity: 6,000 feet per minute.

C. TYPE D-5: ASTM C1071, Type II, rigid, antimicrobial glass fiber duct liner with coated air side.

1. Thermal Conductivity: 0.23 at 75 degrees F.
2. Density: 3.0 pound per cubic foot.
3. Maximum Operating Temperature: 250 degrees F.
4. Maximum Air Velocity: 4,000 feet per minute.

2.7 DUCTWORK INSULATION JACKETS

A. Aluminum Duct Jacket: A foil faced UV resistant, vapor barrier membrane, self-stick, self-healing, with a zero perm rating. Bright white matte finish that meets solar reflectance and emissivity of Cool Roof Rating Council (CRRC) and California Title 24.

1. Manufacturers: Alumaguard.

2.8 DUCTWORK INSULATION ACCESSORIES

A. Vapor Retarder Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

B. Vapor Retarder Lap Adhesive: Compatible with insulation.

C. Adhesive: Waterproof, ASTM E162 fire-retardant type.

D. Liner Fasteners: Galvanized steel, impact applied with press-on head.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Lagging Adhesive: Fire resistive to ASTM E84, NFPA 255 or UL 723.

G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

H. Adhesives: Compatible with insulation.

I. Membrane Adhesives: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify piping, equipment and ductwork has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide Intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.

C. Piping Systems Conveying Fluids Below Ambient Temperature:

1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, expansion joints, and through hangers.
2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Glass Fiber Board Insulation:

1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.

E. Hot Piping Systems less than 140 degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
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.
3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

F. Hot Piping Systems greater than or equal to 140 degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
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.
3. Insulate flanges and unions at equipment.

G. Inserts and Shields:

1. Piping 1-1/2 inches Diameter and Smaller: Install [galvanized] steel shield between pipe hanger and insulation.
2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
    a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
    b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.

3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

H. Insulation Terminating Points:

1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
3. Condensate Piping: Insulate entire piping system and components to prevent condensation.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

J. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum or stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

K. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

L. Prepare pipe insulation for finish painting. Refer to Division 09.

3.3 INSTALLATION - DUCTWORK SYSTEMS

A. Duct dimensions indicated on Drawings are finished inside dimensions.

B. Insulated ductwork conveying air below ambient temperature:

1. Provide insulation with vapor retarder jackets.
2. Finish with tape and vapor retarder 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 ductwork conveying air above ambient temperature:

1. Provide with or without standard vapor retarder jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with aluminum jacket.

E. External Glass Fiber Duct Insulation:

1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
2. Secure insulation without vapor retarder with staples, tape, or wires.
3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. External Elastomeric Duct Insulation:

1. Adhere to clean oil-free surfaces with full coverage of adhesive.
2. Seal seams and butt joints with manufacturer's recommended adhesive.
3. When application requires multiple layers, apply with joints staggered.
4. Insulate standing metal duct seams with insulation of like material and thickness as adjacent duct surface. Apply adhesive at joints with flat duct surfaces.
5. Lift ductwork off trapeze hangers and insert spacers.

G. Duct Liner:

1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

H. Prepare duct insulation for finish painting. Refer to Division 09.

3.4 SCHEDULES

A. Piping Fluid Types and Temperatures:

Fluid Type	Insulation Type	Expected Operating Temperature
Chilled Water Supply and Return	P-1	40-60°F
Condensate Piping from Cooling Coils	P-2	40-60°F
Refrigerant Liquid	P-2	105-140°F
Refrigerant Gas	P-2	40-60°F
Heating Water Supply and Return	P-1	105-140°F

B. Minimum Pipe Insulation Thickness (in inches)

Fluid Operating Temperature Range and Usage (°F)	Insulation Conductivity		Nominal Pipe or Tube Size (inches)				
	Conductivity $\frac{(Btu \times in.)}{(h \times ft^2 \times °F)}$	Mean Rating Temperature (°F)	<1"	1" to <1-1/2"	1-1/2" to <4"	4" to <8"	>8"
105-140	0.21 – 0.28	100	1.0	1.0	1.5	1.5	1.5
40-60	0.21 – 0.27	75	0.5	0.5	1.0	1.0	1.0

C. Equipment Insulation Schedule

Equipment Type	Insulation Type	Thickness
Chilled Water Air Separators	E-8	1.0”
Chiller Cold Surfaces (Not Factory Insulated)	E-8	1.0”

D. Ductwork Insulation Schedule:

Duct Type	Insulation Type	Thickness
Outside Air Intake	D-1	R6
Rectangular Supply and Return Ducts in Crawlspace (internally insulated)	D-4	R12
Rectangular Supply and Return Ducts inside Building Thermal Envelope (internally insulated)	D-4	R6
Rectangular Floor Grille Supply and Return Duct Boots in Crawlspace (externally insulated)	D1	R12
Round Supply and Return Ducts in Crawlspace (externally insulated)	D-1	R12
Round Supply and Return Ducts inside Building Thermal Envelope (externally insulated)	D-1	R6
Exhaust Ducts Within 10 feet of Termination to Exterior	D-1	R6
Exhaust Ducts Located Outdoors or in Unconditioned Spaces	D-1	R6
Transfer Air Ducts (internally insulated)	D-4 or D-5	1/2”

END OF SECTION

SECTION 23 0923
DDC BUILDING CONTROLS

PART 1 GENERAL

1.1 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Hydronic control valves

B. Hydronic pressure and temperature sensor wells and sockets

C. Terminal unit controls

1.2 PRODUCTS NOT FURNISHED OR INSTALLED BUT INTEGRATED WITH THE WORK OF THIS SECTION

A. Boiler controls

B. Chiller controls

1.3 GENERAL REQUIREMENTS

A. Provide a stand-alone building management system (BMS) utilizing “Tridium” JACE 9000 or later.

1.4 APPROVED MANUFACTURERS

A. Approved Control Manufacturers

1. Tridium

1.5 CODES AND STANDARDS

A. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.

1. International Energy Conservation Code – IECC 2015

2. ASHRAE/ANSI 135-2012 (BACnet) - (System Level Devices) - Building Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers’ control systems and devices.

3. ASHRAE/ANSI 135-2012 (BACnet) - (Unit Level Devices) - Unit Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers’ controls.

1.6 SUBMITTALS

A. BAS manufacturer shall provide shop drawings and manufacturers’ standard specification data sheets on all hardware and software being provided for this project. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications.

1. See section 23 05 00 for requirements on submittal format.

B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the BAS manufacturer of furnishing quantities required based upon contract documents.

C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with the specifications or which is deemed valuable in documenting and understanding the system to be installed.

D. All shop drawings shall be provided to the Owner electronically as PDF file formats once they have been approved and as-built drawings have been completed.

E. Submit the following:

1. A complete bill of materials of equipment to be used indicating quantities, manufacturers and model numbers.
2. A schedule of all control valves including the valve size, pressure drop, model number (including pattern and connections), flow, CV, body pressure rating, and location.
3. Provide all manufacturers' technical cut sheets for major system components. When technical cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Include:
    a. Building Controllers
    b. Custom Application Controllers
    c. Application Specific Controllers
    d. Operator Workstations
    e. Portable Operator Terminals
    f. Auxiliary Control Devices
4. Provide proposed Building Automation System architectural diagram depicting various controller types, workstations, device locations, addresses, and communication cable requirements
5. Provide detailed termination drawings showing all required field and factory terminations, as well as terminal tie-ins to DDC controls provided by mechanical equipment manufacturers. Terminal numbers shall be clearly labeled.
6. Provide a sequence of operation for each controlled mechanical system and terminal end devices.
7. Provide a BACnet Protocol Implementation Conformance Statement (PICS) for each BACnet system level device (i.e. Building Controller & Operator Workstations) type. This defines the points list for proper coordination of interoperability with other building systems if applicable for this project.

F. Project Record Documents: Upon completion of installation, submit electronic copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:
1. Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .dwg and .pdf drawing files shall be provided.
2. Testing and Commissioning Reports and Checklists signed off by trained factory (equipment manufacturers) and field (BAS) commissioning personnel.
3. Operating and Maintenance (O & M) Manuals - These shall be as-built versions of the submittal product data. In addition to the information required for the submittals, Operating & Maintenance manual shall include:
    a. Procedures for operating the BAS including logging on/off, alarm management, generation of reports, trends, overrides of computer control, modification of setpoints, and other interactive system requirements.
    b. Explanation of how to design and install new points, new DDC controllers, and other BAS hardware.
    c. Documentation, installation, and maintenance information for all third party hardware/software products provided including personal computers, printers, hubs, sensors, valves, etc.
    d. Original issue media for all software provided, including operating

systems, programming language, operator workstation software, and graphics software.

e. Licenses, Guarantee, and Warranty documents for all equipment and systems.

G. Training Manuals: The BAS manufacturer shall provide a course outline and copies of training manuals at least two weeks prior to the start of any corporate training class to be attended by the Owner.

PART 2 PRODUCTS

2.1 SYSTEMS

A. Approved system manufacturers:

1. Tridium Vykon Niagara N4 JACE 8000 with Workplace N4 Version 4.15.0.0 or newer Software.

2. ii. Solidyne BACnet DEC-UC-2 Series Universal Digital Controllers.

B. Only Tridium systems using BACnet Protocol (ASHRAE 135 Standard) are permitted. All systems and devices shall have the ability to be integrated into the Tridium Web Supervisor front-end platform.

C. Each panel shall be fully licensed using non “proprietary” license files, listing SUIT as the owner and shall include BACnet Client/Server options.

D. All I/P networking shall be on SUIT’s IT network. No ethernet driven sub-networks, only building level BACnet MSTP local networks are approved. Coordinate I/P requirements with the SUIT C&PM Project Manager prior to start of Construction Documents.

E. I/P Addresses will be assigned by the Southern Ute Indian Tribe (SUSS) IT Department. To gain assignment, MAC address(s) shall be provided for each device to be connected, included with device name, function and physical location.

F. The contractor/vendor shall be fully trained, certified and authorized by the manufacturer as a local dealer or branch office. The successful contractor/vendor to maintain an ample parts inventory to supply SUIT Property & Facilities’ (P&F) Building Maintenance with parts on an as needed basis. All “regularly used” components (i.e. JACE’s & DDC components) shall be available within 24 hours of ordering.

G. All panels shall have 1 open and useable 120 VAC convenience outlet located within the panel.

H. Individual power supplies to panel devices shall be provided through a “single switched” circuit to allow easy de-energization during service.

I. BMS system shall be fully integrated with other systems using BACnet protocols (Blower Coil Unit controllers, Variable Speed Drives, Occupancy Sensing, Chillers, Boilers, Water Pumping Packages, etc.) The points to be integrated shall include all points offered by the system manufacturer and will be subject to review and approval by the SUIT Property and Facilities (P&F) Building Maintenance HVAC Dept. At P&F’s discretion, points may be omitted if deemed not needed.

J. System HVAC zones not controlled by occupancy sensing shall each be configured with a local seven (7) day time of day (with holidays) schedule (separate schedule per zone or equipment) which can be easily managed via the front-end graphics. Each zone shall provide four temperature set points, each separately adjustable depending on occupancy status.

1. Un-occupied Cooling

2. Occupied Cooling

3. Occupied Heating

4. Un-Occupied Heating

K. The system architecture shall be fully modular permitting expansion of application software, system peripherals, and field hardware.

L. The system, upon completion of the installation and prior to acceptance of the project or inspection by the commissioning agent and P&F, shall perform all operating functions, display all integrated points (including sub systems) and accept all operator commands via the front-end graphical system as detailed in this specification.

M. The system will, using the SUIT's ethernet, be capable of alarming a critical alarm condition within ten (10) seconds of field occurrence for all vendor-supplied points. Non-critical alarms, alert conditions, and return-to-normal transitions will be logged and displayed at any operator workstation within twenty (20) seconds of their occurrence in the field. All graphic displays must display the graphic and display all values within ten (10) seconds of initiation, and data can be no older than twenty (20) seconds from a true field value.

N. The system shall be designed so all individual alarm points for each piece of equipment triggers one "general alarm" per equipment is visible on the frontend graphics. This alarm will be selectable and generate a pop-up menu providing more detailed information on the exact alarm(s).

O. All controllable points (i.e.: valve positions, start/stops and set points) shall be provided with a "timed override" feature so that commanded points shall return to automatic control upon the expiration of the override timer. This "timed override" feature shall be a form of a pop-up menu that is operator selectable from the graphic which the equipment is located.

P. Building systems integration:

1. All indicated equipment shall be required to have the ability to interface with other automation systems on equipment located throughout SUIT or tridium web supervisor are the two approved HMI's. This section establishes seamless interconnection with third party electrical and mechanical building systems. These subsystems shall be controlled and monitored through the same front-end system as deemed by P&F and are graphically programmed with the same user consoles as provided to each and every operator station.

2. All desired system information to or from the indicated equipment shall be available to the system. No limits shall be placed by the equipment manufacturer on the owner with regard to the access of or the transmission of or what may be done with the data provided from the equipment control system.

3. Full cooperation by the equipment manufacturer in this open protocol effort shall be a requirement for bidding. No exceptions shall be allowed to this requirement, and no bid shall be accepted which does not define clearly and exactly how the proposed equipment will comply with this section. This includes but is not limited to all variable frequency drives (vfd), electric power equipment, emergency generators, lighting systems, and the air quality monitoring system.

2.2 COMMONS DETAILS FOR ALL GRAPHIC PAGES

A. Graphics shall be simulated and submitted for approval prior to creation. All graphics shall allow for full operator interaction including PID loop tuning, schedule changes, zone temperature or other process variable current values and temporary over riding ability. Provide backgrounds showing walls, room numbers and such as provided by the project ACAD drawing layers. Graphics shall include setpoint vs. actual values for all analog points. Highly integrated sub systems may use textual pages to display large amounts of integrated data (i.e. reports).

B. Standard colors and dimensions all graphic pages:

1. The dimensions of the graphic page shall be 1600 pixels wide and 900 pixels high.

2. The background color of graphic pages shall be gradient “black” (hex- #ff000000 to #ff164668).
3. All images to represent mechanical systems shall come from “ControlPix 3D Graphics and Niagara “KitPxGraphics” module(s). Additional graphic images may be required for a specific project and must be approved by P&F Building Maintenance Hvac Dept.

C. Banner/Header for all graphic pages:
1. The dimensions of the banner/header shall be 1200 pixels wide and 100 pixels high.
2. The background color of the banner/header shall be “black” (hex-#ff000000 to #ff1644668) to match and blend into the graphics page.
3. The border frame shall be style “Solid”, width “1.00”, brush “#404040”.
4. The Building Name and Equipment Description Bound Label font shall be “White” “20.0pt Georgia”. And centered in the border frame.
5. The Border shall have link buttons listing a “Home”, “HW System”, “CHW System”, “Floor Plan(s)”, “BC Report “, “Chart Builder”, “OSA Temp” etc. depending on the project.
6. The link button dimensions shall be 120 pixels wide and 20 pixels high.
7. The link button bound label font shall be “White” “Bold 11.0pt Tahoma”.
8. The link button border frame shall be “Solid”, width “1.00”, Silver “#ffc0c0c0”.

D. Hydronic piping sizes:
1. All piping and fitting images shall be aligned.

E. Hydronic piping colors:
1. Heating water supply: dark red in appearance.
2. Heating water return: light red in appearance
3. Chilled water supply: dark blue in appearance.
4. Chilled water return: light blue in appearance.

F. Overlapping piping:
1. When two pipes of the same color intersect, one of the pipes shall separate in length to prevent false indication of a “4-way cross”.
2. When two pipes of different colors intersect, they may overlap without modification.

G. Graphic font:
1. The font used for point bound labels text shall be “Black” “14.0pt Georgia”.
2. The font used for graphic page title bound labels text shall be “White” “18.0pt Georgia”.
3. Background colors shall also be utilized to indicate point status (alarm, down, overridden, fault, etc.) Using the Niagara 4 default colors.

H. Room temperature spectrum bindings animation on floor plan graphics and graphics is as follows:
1. The background color shall increase brightness with greater deviation below effective heating/cooling setpoint.

I. Decimal precision. Unless indicated otherwise, point values shall use following decimal precision:

1. Temperatures (°F) and temperature setpoints: 1 decimal place.
2. Flow air (CFM) and water (gal/min) and airflow setpoints: no decimal places.
3. Percent (%): 1 decimal place.
4. Pressure (in/wc) and duct static pressure setpoints: 1 decimal place.
5. Pressure (in/wc) and building static pressure setpoints: 2 decimal places.
6. Air and water pressure (psi) and setpoints: 1 decimal place.
7. Humidity (%RH) and humidity setpoints: 1 decimal place.
8. Enthalpy (btu/lb): 1 decimal place.
9. Concentration (ppm): no decimal places.
10. Frequency (Hz): 1 decimal place.
11. Time: hours (hr), minutes (min), seconds (s), days (day), weeks (wk), months (mo), years (yr): no decimal places.

J. Historical data view:

1. The chart builder header button will navigate to the AX history chart builder page.
2. Expand the navigation tree and navigate to the “Histories” database to drag-and-drop histories onto the history viewer.

K. Wire sheet view:

1. Wire sheets shall be neat and orderly with text blocks to describe the contents of the folder like point types and programming sequences. All objects shall be given a descriptive name.
2. Unit schedule- are in all units that require a schedule and are linked to vykon optimized start stop (OSS) and the building schedule.

2.3 FIELD DEVICES

A. Temperature sensors:

1. Provide temperature sensors for duct, immersion, remote probe, and outside air applications.
2. DDC temperature sensors shall be of the 10k or 10,000-ohm type 3 thermistor type.
3. All sensors of a particular category shall be of the same type manufacturer and shall have an interchangeability of +/- 0.1% at thee reference temperature.
4. Sensor time constant response to temperature change time shall be less than three (3) seconds per degree change.
5. Sensors requiring field-calibration shall not be acceptable.
6. All sensors shall be precise and accurate so that they do not require adjustments or calibrations.
7. Minimum sensor operating ranges shall be as follows:
   a. Chilled water – 30°F to 100°F
   b. Air systems – 0°F to 150°F
   c. Outside air – 0°F to 120°F
   d. Hot water – 40°F to 240°F

B. Duct sensors:

1. Provide probe type sensors designed for duct type mounting.
2. Sensor shall be encapsulated in an aluminum probe 8” to 12” in length

depending on location. Provide stainless steel probes in high humidity areas.

3. Averaging sensors shall be 10k or 10,000-ohm, type 3, copper jacket (flexible) or 24” 10k type 3, stainless probe depending on location.
4. Sensors shall include a suitable junction box for terminating sensor wiring and shall include a lagging protrusion where installed in externally insulated ducts.
5. Adjacent to each sensor provide a test hole plugged with a removable cap or plug to be used for test and calibration purposes.
6. All sensors shall be located in the most easily accessible location while providing accurate temperature sampling.

C. Immersion sensors:

1. Provide immersion type sensors with a ½“OD threaded fitting for direct installation in a thermo-well.
2. The probe shall be encapsulated in an aluminum, brass, or stainless-steeljacket as deemed appropriate by the project engineer and shall be installed in a stainless steel thermo-well suitable for installation in a ¾“NPT threaded fitting.
3. Sensors shall include a suitable junction box for terminating sensor wiring.
4. Thermo-wells shall have pressure and temperature ratings suitable for their application.
5. Thermo-wells for insulated piping shall have a 2-1/2“lagging protrusion.
6. Locate thermo-wells so the sensing probe will give a true and correct temperature reading.
7. Install thermo-wells on the side of pipes and so as to not cause undue restriction in small piping.
8. Where thermo-wells are located in pipe lines 1-1/2“ and smaller, provide a section of pipe of such diameter that the net area of the pipe line will not be reduced by the thermometer well.
9. All thermo-wells shall be filled with thermal grease or conductive compound and complete with caps and chains.
10. Thermo-wells installed on 2-1/2” piping and larger shall be installed at 45-degree angle in the direction of water flow in the monitored piping.

D. Remote probe sensors:

1. Provide remote probe sensors with sensing elements encapsulated in a nominal 2” stainless steel sheath suitable for return air, or strap-on mounting.
2. Sensors shall include a nominal 3’ lead section and a suitable junction box for terminating sensor wiring.

E. Outside air sensors:

1. Provide shielded weatherproof outside air sensors with sensing elements encapsulated in a nominal 2” stainless steel sheath suitable for outdoor applications.
2. Sensors shall include a waterproof junction box, or conduit body for terminating sensor wiring and a sun shield.
3. Location shall be on exterior north sidewall at a level requiring a six (6) foot stepladder for servicing. Do not install at ground accessible level.
4. Accepted manufacture: ACI controls model: A/AN-O-Sun or equivalent.

F. Electronic analog sensors:

1. Range: sensors shall operate within the range indicated above for heating, ventilating, and air conditioning (hvac) systems.
2. Accuracy: provide electronic analog sensors with an accuracy of +/- 0.5°f.
3. Provide sensors with a time constant response to achieve 60% of a step temperature change in six (6) seconds in air or water flowing at three (3) feet per second.
4. Sensors of the same type shall be interchangeable without calibration.

G. Flow sensors:

1. Provide sensors for measuring flow in piping and ductwork that are compatible with static pressure and differential pressure analog of the pneumatic and electronic controllers served.
2. Provide sensors with an output characteristic which gives a continuous mathematical function over the full range of flow from maximum to minimum required.
3. Mount flow sensor concealed in public spaces or exposed in mechanical equipment room.

H. Temperature indicators:

1. Provide a temperature indicator for each sensor and thermostat.
2. Sensing elements shall be compatible to, and similar to, those of sensors, thermostats, and thermostatic switches.
3. Sensing elements for pipes and taps shall have separable stainless steel or bronze screw wells with heat sensitive liquid in the well.
4. Select indicators with the midpoint range readings approximately equal to the normally expected temperature of the measure medium.
5. For local indication provide liquid-in-glass or remote bulb dial type indicators. For remote indication provide sensor-transmitter with remote indicator.
    a. Liquide-in-glass indicators shall be remote reading, seven (7) inches long, bronze or stainless-steel casings, rigid stem, adjustable, with stainless steel or bronze screw insertion wells for piping or bolted insertion for air.
6. Digital temperature indication
    a. Solar thermometer shall be accurate within 1% of reading or 1 degree whichever is greater, ambient operating -30°F to 140°F, range: -50°F to 300°F, Lux: 10, Humidity: 100%, sensor: NTC.
    b. Accepted manufacture: Weiss

I. Damper operators/actuators:

1. Sized for specific application.
2. Control voltage shall be 0-10 VDC modulating unless specified as open/closed.
3. Accepted manufacture: Belimo Actuators

J. Automatic control valves:

1. Sized for specific application. (provide separate valve schedule)
2. All valves shall be installed with plastic engraved name tags to match valve schedule. Attach with stainless steel chain.

3. Sequence staging shall be provided via the DDC system.
4. Control valves over ½", shall be provided with a means to manually position the valve.
5. Accepted manufacture: Belimo Actuators & Valves.

K. Miscellaneous Field Devices:

1. All field mounted valves, damper actuators, and sensors shall have engraved type nameplates attached by stainless steel chain. Id tag shall identify the device as shown on submittal drawings. "Dymo" type labels shall not be acceptable, except for room sensors.
2. Field devices such as E/P's, P/E's, I/P's and relays shall be located in their equipment's respective control panel.
3. Wall mounted devices are not acceptable.
4. All field installed control devices, such as JACE's, DDC controllers, relays, and such devices shall be installed inside a rated enclosure with wiring protected from external hazards.
5. All field control panels containing devices shall be equipped with a hinged lockable door.
6. Each panel and all devices inside each panel shall bear engraved nameplates which correspond to the ID as shown on submittal drawings. To be reviewed and approved by SUIT P&F building maintenance HVAC department.
7. Do not attach nameplates to devices, rather attach to mounting back plane.
8. All devices shall be wired through a wiring terminal strip located within the panel.
9. Each terminal shall be identified to match submittal drawings.
10. Provide each panel with a 120 VAC switch, breaker and receptacle to accommodate test equipment.

PART 3 EXECUTION

3.1 EXAMINATION

A. The Contract Documents shall be thoroughly examined for coordination of control devices, their installation, wiring, and commissioning. Coordinate and review mechanical equipment specifications, locations, and identify any discrepancies, conflicts, or omissions that shall be reported to the Architect/Engineer for resolution before rough-in work is started.

B. The BAS manufacturer shall inspect the jobsite in order to verify that control equipment can be installed as required, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.2 PROTECTION

A. The BAS installation contractor shall protect all work and material from damage by their work or personnel, and shall be liable for all damage thus caused.

B. The BAS manufacturer shall be responsible for their work and equipment until final inspection, testing, and acceptance. The BAS installing contractor shall protect their work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 COORDINATION

A. Site

1. Where the mechanical work will be installed in close proximity to, or will interfere

with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.

2. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.

B. Submittals. Refer to the “Submittals,” section of this specification for requirements.

C. Test and Balance

1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
2. The contractor shall provide training in the use of these tools. This training will be planned for a duration of 4 hours.
3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
4. The tools used during the test and balance process shall be returned to the contractor at the completion of the testing and balancing.

D. Coordination with Controls Specified in Other Sections or Divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:

1. All communication media and equipment shall be provided as specified in the “Communication” section of this specification.
2. Each supplier of a controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.
3. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.

3.4 GENERAL WORKMANSHIP

A. Install equipment, piping, wiring/conduit, parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible locations as defined by National Electric Code (NEC). Control panels shall be attached to structural walls or properly supported in a free-standing configuration, unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

D. Verify integrity of all control wiring to ensure continuity and freedom from shorts and grounds prior to commencing the startup and commissioning procedures.

E. All control device installation and wiring shall comply with Contract Documents, acceptable industry specifications, and industry standards for performance, reliability, and compatibility. Installation and wiring shall be executed in strict adherence to local codes and standard practices referenced in Contract Documents.

3.5 FIELD QUALITY CONTROL

A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Contract Documents.

B. BAS manufacturer shall continually monitor the field installation for building code

compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.

C. BAS installing Contractor(s) shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.6 COMMUNICATION WIRING

A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

B. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer shall not be exceeded during installation.

D. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.

E. When a cable enters or exits a building, a lighting arrestor must be installed between the line and ground.

F. All runs of communication wiring shall be unspliced length when the length is commercially available.

G. All communication wiring shall be labeled to indicate origin and destination.

3.7 FIBER OPTIC CABLE

A. All cabling shall be installed in a neat and workmanlike manner. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

B. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post installation residual cable tension shall be within cable manufacturer's specifications.

C. Fiber optic cabinets, hardware, and cable entering the cabinet shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

3.8 INSTALLATION OF SENSORS

A. Sensors required for mechanical equipment operation shall be factory installed and wired as specified in mechanical equipment specifications. BAS manufacturer shall be responsible for coordinating these control devices and ensuring the sequence of operations will be met. Installation and wiring shall be in accordance with the BAS manufacturer's recommendations.

B. Sensors that require field mounting shall meet the BAS manufacturer's recommendations and be coordinated with the mechanical equipment they will be associated.

C. Mount sensors rigidly and adequately for the environment the sensor will operate.

D. Room temperature sensors shall be installed on concealed junction boxes properly supported by the block wall framing. For installation in dry wall ceilings, the low voltage sensor wiring can be installed exposed and must meet applicable National and Local Electrical Codes.

E. All wires attached to wall mounted sensors shall be sealed off to prevent air from transmitting in the associated conduit and affecting the room sensor readings.

F. Install duct static pressure tap with tube end facing directly down-stream of air flow.

G. Install space static pressure sensor with static sensing probe applicable for space installation where applicable.

H. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each

bend shall be supported with a capillary clip.

I. All pipe mounted temperature sensors shall be installed in matched thermowells. Install all liquid temperature sensors with heat conducting fluid in thermal wells for adequate thermal conductance.

J. Wiring for space sensors shall be concealed in building drywall. EMT conduit is acceptable within mechanical equipment and service rooms.

K. Install outdoor air temperature sensors on north wall complete with sun shield at manufacturer's recommended location and coordinated with Engineer.

3.9 WARNING LABELS

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the BAS system.

B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.

3.10 IDENTIFICATION OF HARDWARE AND WIRING

A. All field wiring and cabling, including that within factory mounted, and wired control panels and devices for mechanical equipment, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information for troubleshooting, maintenance, and service purposes. BAS manufacturer to coordinate this labeling requirement with mechanical equipment manufacturer as it relates to controls.

B. Permanently label or code each point of field terminal strips to show the instrument or item served and correlate them to the BAS design drawings.

C. Identify control panels with minimum 1-cm letters on laminated plastic nameplates.

D. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.11 CONTROLLERS

A. Provide a separate DDC Controller for individual HVAC mechanical equipment. BAS manufacturer shall furnish and coordinate DDC controllers and control devices and ensure that installation and wiring adhere to BAS manufacturer's design recommendations. For those mechanical equipment units that do not have factory installed controls specified, the BAS manufacturer shall field mount controls and coordinate all installation and termination information to ensure the specified sequence of operations are met.

B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type (analog or digital) found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used in each controller.

1. Future use of spare I/O point capacity shall require providing the field instrument and control device, field wiring, engineering, programming, and commissioning. No additional Controller boards or point modules shall be required to implement use of these spare points.

3.12 PROGRAMMING

A. Provide sufficient internal memory for all controllers to ensure specified sequence of operations, alarming, trending, and reporting requirements are achieved. BAS manufacturer shall provide a minimum of 25% spare memory capacity for future use.

B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.

C. Software Programming

1. Provide programming for individual mechanical systems to achieve all aspects of

the sequence of operation specified. It is the BAS manufacturer's responsibility to ensure all mechanical equipment functions and operates as specified in sequence of operations. Provide sufficient programming comments in controller application software to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.

D. BAS Operator's Interface

1. When Operator Workstation is specified, provide color graphics for each piece of mechanical equipment depicting sufficient I/O to monitor and troubleshoot operation. Operator color graphics shall include Chiller Plant, Cooling Tower System, Boiler Plant, Air Handling Units, Rooftop Units, VAV Terminal Boxes, Fan Coil Units, Unit Ventilators, Heat Exchangers, Exhaust Fans, etc. These standard graphics shall depict all points dynamically as specified in the points list and/or indicated in sequence of operation.
2. The BAS manufacturer shall provide all the labor necessary to install, initialize, start up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface data base, and any third party software installation and integration required for successful operation of the operator interface.
3. As part of this execution phase, the BAS manufacturer shall perform a complete test of the operator interface.

3.13 CONTROL SYSTEM CHECKOUT AND TESTING

A. Start-up testing. All testing in this section shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner's representative is notified of the system demonstration.

1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service all of the instruments, controls, and accessory equipment furnished under this specification.
2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturer's recommendations.
4. Verify all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starter, etc.) operate properly and normal positions are correct.
5. Verify all analog output devices (I/Ps, actuators, etc) are functional, that startand span are correct, and that direection and normal positions are correct. The contractor shall check all control valves and autoatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
6. Verify the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimal start/stop routimes.
7. Alarms and Interlocks
    a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper

direction.

c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

3.14 CLEANING

A. The BAS manufacturer's installing contractor(s) shall clean up all debris resulting from their installation activities on a daily basis. The installation contractors shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Owner, Construction Manager, General Contractor, and/or Mechanical Contractor.

B. At the completion of work in any area, the installation contractor shall clean all of their work, equipment, etc., making it free from dust, dirt and debris.

C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage. Any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.15 TRAINING

A. See Section 23 0500 for requirements.

END OF SECTION

SECTION 23 11 00

FACILITY FUEL PIPING

PART 1

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Pipe and pipe fittings.
3. Valves.

1.2 SUBMITTALS

A. Product Data:

1. Pipe Hangers and Supports: Submit manufacturers catalog data including load carrying capacity.
2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

B. Pipe Hangers and Supports: Design data, indicate pipe sizes, load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit spare parts lists and maintenance procedures.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with adopted Fuel Gas Code.

B. List and label flexible connectors in accordance with UL 536.

C. Maintain one copy of each document on site.

1.5 WARRANTY

A. Furnish one year manufacturer warranty for materials and services.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Carpenter & Paterson Inc.
2. Creative Systems Inc.
3. Flex-Weld, Inc.
4. Globe Pipe Hanger Products Inc.
5. Michigan Hanger Co.
6. Superior Valve Co.
7. Substitutions: Permitted.

B. Conform to ASME B31.9; ASTM F708; MSS SP 58; MSS SP 69 or MSS SP 89.

C. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.

D. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

F. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

G. Vertical Support: Steel riser clamp.

H. Floor and Roof Support for Pipe Sizes to 4 inches: 6” tall minimum, Cast iron adjustable pipe saddle, lock nut, nipple, floor steel support.

I. Floor and Roof Support for Pipe Sizes 6 inches and Over: 6” tall minimum, adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

2.2 PIPES AND TUBES

A. Natural Gas Piping, Buried:

1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black with polyethylene jacket and welded joints.

2. Polyethylene Pipe: ASTM D2513, SDR 11.5, with socket type fittings and fusion welded joints.

B. Natural Gas Piping, above Grade:

1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black, with malleable iron or forged steel fittings, screwed or welded.

2. Copper Tubing: ASTM B88, Type K, annealed with wrought copper fittings and compression joints.

2.3 VALVES

A. Manufacturers:

1. American Valve

2. FMC Crosby Valve

3. Red-White Valve Corp.

4. Substitutions: Permitted.

B. Ball Valves:

1. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.

2. Over 2 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals and lever handle.

C. Plug Valves:

1. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

2. Over 2 inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends.

2.4 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:

1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.

3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Strainers:

1. Size 2 inches and Under: Threaded brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
2. Size 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

C. Flexible Connectors:

1. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

D. Pressure Gages:

1. Gage: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   a. Case: Cast aluminum.
   b. Bourdon Tube: Brass or Phosphor bronze Type 316 stainless steel.
   c. Dial Size: 2 inch diameter.
   d. Mid-Scale Accuracy: One percent.
   e. Scale: Both psi and kPa.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavate.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside piping before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.4 INSTALLATION - PIPING SYSTEMS

A. Paint all exposed exterior mounted piping.

B. Install dielectric connections wherever jointing dissimilar metals.

C. Install unions downstream of valves and at equipment or apparatus connections.

D. Route piping parallel to building structure and maintain gradient.

E. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Sleeve pipe passing through partitions, walls and floors. Provide 1” annular clear space between pipe and sleeve.

I. Install piping system allowing clearance for installation of insulation and access to valves and fittings.

J. Install identification on piping systems including underground piping. Refer to Section 23 05 00.

K. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

L. Provide capped tee fittings upstream and downstream of all new gas pressure regulators which do not contain vent limiting devices.

3.5 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves for throttling or manual flow control services.

3.6 INSTALLATION - PIPING SPECIALTIES

A. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge. Extend nipples and siphons to allow clearance from insulation.

B. Install gauges in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

C. Adjust gauges to final angle, clean windows and lenses, and calibrate to zero.

3.7 INSTALLATION - FUEL PIPING

A. Install natural gas piping in accordance with ASME B31.2 and ASME B31.4.

B. Install natural gas piping in accordance with adopted Fuel Gas Code.

C. Provide clearance for installation of insulation and access to valves and fittings.

D. Establish elevations of buried piping outside building to provide not less than 3 ft of cover.

E. Provide support for utility meters in accordance with requirements of utility company.

F. Pipe vents from gas pressure reducing valves to outdoors and terminate in weatherproof hood.

G. Test natural gas piping in accordance with adopted Fuel Gas Code.

3.8 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.9 SERVICE CONNECTIONS

A. Coordinate with local gas company to install new gas service line to new meter and regulator assembly. The cost for this service shall be included in the contractor's bid. All trenching, backfill and surface replacement shall also be included in the contractors bid.

3.10 SCHEDULES

SUPPORT OF PIPING

STEEL PIPE, NOMINAL SIZE OF PIPE (inches O.D.)	SPACING OF SUPPORTS (feet)		COPPER TUBING, NOMINAL SIZE OF TUBING (inches O.D.)	SPACING OF SUPPORTS (feet)
½	6		½	4
¾ or 1	8		⅝ or ¾	6
1 ¼ or larger (horizontal)	10		⅞ or 1 (horizontal)	8
1 ¼ or larger (vertical)	Every floor level		1 or larger (vertical)	Every floor level

SPECIFICATIONS FOR THREADING METALLIC PIPE

IRON PIPE SIZE (inches)	APPROXIMATE LENGTH OF THREADED PROTION (inches)	APPROXIMATE NUMBER OF THREAD TO BE CUT
½	¾	10
¾	¾	10
1	⅞	10
1 ¼	1	11
1 ½	1	11
2	1	11
2 ½	1 ½	12
≥ 3	welded	welded

Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

END OF SECTION

SECTION 23 20 00

HVAC PIPING AND PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Pipe and pipe fittings.
3. Valves.
4. Piping specialties.
5. HVAC piping specialties.
6. HVAC pumps.
7. Chemical treatment.

1.2 SUBMITTALS

A. Shop Drawings: Indicate schematic layout of refrigeration system, including equipment, critical dimensions, and sizes.

B. Shop Drawings: Indicate schematic layout of snowmelt system, including equipment, critical dimensions, and sizes.

C. Product Data:

1. Pipe Hangers and Supports: Submit manufacturers catalog data including load carrying capacity.
2. Valves: Submit Manufacturers catalog information with valve data and ratings for each service.
3. Piping Specialties: Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
4. Pipe Expansion Products: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
5. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Include manufacturer’s catalogue information.
6. Chemical Treatment: Submit chemical treatment materials, chemicals, and equipment.

D. Welders Certificate: Include welder’s certification of compliance with ASME Section IX.

E. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment pumps, valves and accessories.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit spare parts lists and maintenance procedures.

1.4 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

1.5 WARRANTY

A. Furnish one year manufacturer warranty for pumps.

1.6 MAINTENANCE SERVICE

A. Furnish manufacturer's maintenance services of chemical water treatment for one year from Date of Substantial Completion.

B. Furnish chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Carpenter & Paterson Inc.
2. Creative Systems Inc.
3. Flex-Weld, Inc.
4. Globe Pipe Hanger Products Inc.
5. Substitutions: Permitted.

B. Conform to ASME B31.1.

C. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

D. Hangers for Cold Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.

F. Multiple or Trapeze Hangers for Pipe Sizes to 4 inches: Steel channels with welded spacers and hanger rods.

G. Wall Support for Pipe Sizes to 3 inches: Cast iron hooks.

H. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

I. Vertical Support: Steel riser clamp.

J. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

K. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

L. Floor Support for Hot Pipe Sizes 6 inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

M. Copper Pipe Support: Copper-plated, carbon steel ring.

2.2 PIPES AND TUBES

A. Hydronic Water Piping (Above Grade):

1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40, black, malleable iron or forged steel fittings, threaded or welded joints.
2. Copper Tubing: ASTM B88, Type L hard drawn, cast brass, wrought copper, or mechanically extracted fittings, lead free solder joints.

B. Hydronic Water Piping (Below Grade):

1. PEX: ASTM 814, ASTMF876, ASTMF877, ASTMF1960, ASTM F2389, PEX-a Engel-method crosslinked polyethylene piping with fittings manufactured by the pipe manufacturer and listed to all applicable ASTM standard above. Pipe to be pre-insulated pipe with closed cell polyurethane foam (PUF) insulation and 30-year U.V. resistant PP-RCT polypropylene outer layer rated for direct burial, “Nupi” Niron Clima AllPro or equal.

C. Equipment Drains and Overflows:

1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black steel, malleable iron or forged steel fittings, threaded or welded joints.
2. Copper Tubing: ASTM B88, Type M, hard drawn, cast brass, wrought copper or mechanically extracted fittings, lead free solder joints.
3. PVC Pipe: ASTM D1785, Schedule 40 or ASTM D2241, SDR 21 or 26 solvent weld joints. Provide a plenum wrap system if PVC is used in a return air plenum.

2.3 VALVES

A. Manufacturers:
1. American Valve.
2. Red-White Valve Corp.
3. Substitutions: Permitted.

B. Gate Valves:
1. Up to 2 inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, double wedge disc, soldered or threaded.
2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, solid wedge, flanged or grooved ends.

C. Ball Valves:
1. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
2. Over 2 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals and lever handle.

D. Butterfly Valves:
1. Up To 2 inches: Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, 10-position lever handle.
2. Over 2 inches: Iron body, chrome plated iron disc, resilient replaceable seat, wafer or lug ends, extended neck, 10 position lever handle.

E. Swing Check Valves:
1. Up to 2 inches: Bronze body and swing disc, solder or threaded ends.
2. Over 2 inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

F. Relief Valves:
1. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

G. Balancing Valves:
1. Pre-balance design capabilities
2. Positive shut off
3. Memory stop indicator
4. Integral valves readout ports

2.4 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:
1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.

3. Grooved and Shouldered Pipe End Couplings: Malleable iron housing, C-shape elastomer composition sealing gasket, steel bolts, nuts, and washers.
4. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Strainers:
1. Manufacturers:
a. Industry Standard
b. Substitutions: Permitted.
2. Size 2 inches and Under: Threaded brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
3. Size 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
4. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

C. Flexible Connectors:
1. Manufacturers:
a. Industry Standard
b. Substitutions: Permitted.
2. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

D. Air Vents:
1. Manufacturers:
a. Industry Standard
b. Substitutions: Permitted.
2. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
3. Float Type: Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
4. Float Type: Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

E. Pressure Gauges:
1. Manufacturers:
a. Weiss
b. Substitutions: Permitted.
2. Gauge: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
a. Case: Steel.
b. Bourdon Tube: Brass.
c. Dial Size: 2 inch diameter.
d. Mid-Scale Accuracy: One percent.
e. Scale: Both psi and kPa.

F. Thermometers:
1. Manufacturers:

a. Weiss
b. Substitutions: Permitted.

2. Digital Type Thermometer: self-powered, adjustable angle, hi impact ABS case with adjustable joint with positive locking device.
   a. Display: ½" LCD display.
   b. Range: -50/300 deg.F.
   c. Stem: Brass, 3/4 inch NPT, 3-1/2 inches long.
   d. Accuracy: 1% or 1 deg.F.
   e. Calibration: degrees F.

2.5 HVAC PIPING SPECIALTIES

A. Expansion Tanks:
1. Manufacturers:
   a. Taco
   b. Amtrol
   c. Bell & Gossett
   d. Substitutions: Permitted.
2. Construction: Closed, welded steel, ASME tested and labeled, 100 psig rating; cleaned, prime coated, and supplied with steel support saddles; with taps for installation of accessories.

B. Air Separators:
1. Manufacturers:
   a. Spirotherm
   b. Taco
   c. Amtrol
   d. Bell & Gossett
   e. Substitutions: Permitted.
2. In-Line dirt/air Separators: Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; ASME tested and stamped; for 125 psig operating pressure.

2.6 HVAC PUMPS

A. Manufacturers:
1. Grundfos
2. Taco
3. Bell & Gossett
4. Armstrong
5. Substitutions: Permitted.

B. In-Line Circulators:
1. Type: Variable speed with resiliently mounted motor for in-line mounting for 125 psig maximum working pressure.
2. Construction: Cast iron casing with flanged connections. Composite rotor.
3. Control: Integral speed controller with digital control display.
4. Sensors: Integral temperature and differential pressure sensors.

2.7 CHEMICAL TREATMENT

A. Manufacturers:

1. Dow
2. DuPont.
3. Substitutions: Permitted.

B. System Cleaner: Liquid alkaline compound with emulsifying agents and detergents design for use in a closed loop hydronic system.

C. Closed System Treatment (Water):

1. Sequestering agent to reduce deposits and adjust pH.
2. Corrosion inhibitors.
3. Conductivity enhancers.

D. By-pass (Pot) Feeder: 2 quart with quick opening cap.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavate.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside piping before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.4 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Sleeve pipe passing through partitions, walls and floors.

H. Install piping system allowing clearance for installation of insulation and access to valves and fittings.

I. Install identification on piping systems including underground piping. Refer to Section 23 05 00.

J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

K. Pressurize snowmelt piping prior to pouring of concrete and keep system under pressure until concrete is set.

L. Provide photographs of snowmelt piping prior to pouring concrete and include photos in O&M manuals.

M. Pressure test hydronic system to 1.5 working pressure but no less than 100psig.

N. Provide cleaning and flushing of all hydronic systems. See plans for more detail.

3.5 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves for throttling, bypass, or manual flow control services.

D. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

E. Install spring loaded check valves on discharge of pumps.

F. Install butterfly valves interchangeably with gate and globe valves.

G. Install 3/4 inch ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest drain.

3.6 INSTALLATION - PIPING SPECIALTIES

A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gauge.

B. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gauge.

C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

D. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

F. Install manual air vents at system high points.

G. For automatic air vents in ceiling spaces or other concealed locations, install vent tubing to nearest drain.

H. Install air separator on suction side of system circulation pump and connect to expansion tank.

I. Provide drain and hose connection with valve on strainer blow down connection.

J. Pipe relief valve outlet to nearest floor sink.

3.7 INSTALLATION - HEATING AND COOLING PIPING

A. Install piping in accordance with ASME B31.9.

B. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

C. Support tanks inside building from building structure.

D. Install relief valves on boilers.

E. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment. Install piping from relief valve outlet to nearest floor sink.

F. Support piping adjacent to pump so no weight is carried on pump casings. For close coupled or base mounted pumps, install supports under elbows on pump suction and discharge line sizes 4 inches and over.

G. Install line size shut-off valve and strainer on pump suction. Install line size check valve and shut-off valve on pump discharge.

H. Install air cock and drain connection on horizontal pump casings. Install drain piping for bases and seals, piped to and discharging into floor drains. Lubricate pumps before start-up.

I. Cleaning:

1. After completion, fill, start, and vent prior to cleaning. Use water meter to record capacity in each system. Place terminal control valves in open position during cleaning.

2. Add cleaner to closed systems at concentration as recommended by manufacturer.

3. Apply heat and circulate for 12 hours minimum. Remove heat and cool; drain systems and refill with clean water. Circulate for 6 hours at design temperatures, then drain. Refill with clean water. Repeat until system cleaner is removed.

4. Flush fluid cooler’s open systems with clean water for one-hour minimum. Drain completely and refill.

5. Remove, clean, and replace strainer screens. Disassemble system components to inspect and remove sludge. Flush low points with clean water after cleaning process is completed.

3.8 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.9 SCHEDULES

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 2)	8	11	1/2	1/2
3	8	12	1/2	1/2
4	8	14	1/2	5/8
5	8	16	1/2	5/8
6	8	17	5/8	3/4

B. Plastic and Ductile Iron Pipe Hanger Spacing:

PIPE HANGER SPACING		
PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
ABS (All sizes)	4	3/8
FRP (All Sizes)	4	3/8
Ductile Iron (Note 2)		
PVC (All Sizes)	4	3/8

C. Note 1: Refer to manufacturer’s recommendations for grooved end piping systems.

D. Note 2: 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

END OF SECTION

SECTION 23 30 00

HVAC AIR DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ductwork.
2. Ductwork accessories.
3. Fans.
4. Terminal units.
5. Air Outlets.
6. Filters.

1.2 SUBMITTALS

A. Product Data:

1. Submit sizes, capacities, materials, controls and connections to other work.
2. Submit catalog performance ratings, construction, electric and duct connections, flashing and dimensions for fans and exhausters.

B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts lists, and wiring diagrams.

C. Manufacturer's Installation Instructions: Submit relevant instructions.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit instructions for filter replacement, spare parts lists, and wiring diagrams.

1.4 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 DUCTWORK

A. Duct Materials:

1. Manufacturers:
   a. United McGill
   b. Semco
   c. Tangent Air
   d. Substitutions: Permitted.
2. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90/A90M.
3. Steel Ducts: ASTM A1008/A1008M
4. Stainless-Steel Ducts: Comply with ASTM A 480/A 480M, Type 304.
5. Aluminum Ducts: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
6. Fasteners: Rivets, bolts, or sheet metal screws.
7. Hanger Rod: ASTM A36/A36M; steel , galvanized; threaded both ends, threaded one end, or continuously threaded.

B. Ductwork Fabrication:

1. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
2. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible (Round Duct Construction Standards), and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
3. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
4. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
5. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
6. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
7. All ductwork to be constructed per SMACNA low pressure classification, 2.0”w.c. max. see table 6-1 of the IMC.
8. As a minimum all ductwork shall be sealed to SMACNA Class B.

C. Insulated Flexible Ducts:
1. Manufacturers:
   a. Atco
   b. Substitutions: Permitted.
2. Product Description: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helical wound spring steel wire; fiberglass insulation; polyethylene or aluminized vapor barrier film.
   a. Pressure Rating: 10 inches wg positive and 1.0 inches wg negative.
   b. Maximum Velocity: 4000 fpm.
   c. Temperature Range: -20 degrees F to 210 degrees F.
   d. Thermal Resistance: 4.2 square feet-hour-degree F per BTU.

D. Single Wall Spiral Round Ducts:
1. Manufacturers:
   a. McGill AirFlow Corporation
   b. Semco Incorporated
   c. Tangent Air Corp.
   d. Spiral Mfg. Co., Inc.
   e. Substitutions: Permitted.
2. Product Description: UL 181, Class 1, round spiral lock seam duct constructed of galvanized steel.
3. Duct Coating: Polyvinyl chloride plastic, 4 mil thick on outside. Temperature range: minus 30 degrees F to 200 degrees F.
4. Construct duct with the following minimum gages:

Diameter	Gage
3 inches to 14 inches	26
15 inches to 26 inches	24
28 inches to 36 inches	22
38 inches to 50 inches	20
52 inches to 84 inches	18

5. Construct fittings with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	24
15 inches to 26 inches	22
28 inches to 36 inches	20
38 inches to 50 inches	20
52 inches to 60 inches	18
62 inches to 84 inches	16

E. Transverse Duct Connection System:

1. Manufacturers:
   a. Cedinor
   b. Ductmate
   c. Substitutions: Permitted.
2. Product Description: SMACNA "E" rated; SMACNA "F" rated or SMACNA "J" rated rigidity class connection, interlocking angle, and duct edge connection system with sealant, gasket, cleats, and corner clips.

2.2 DUCT ACCESSORIES

A. Volume Control Dampers:

1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.
2. Fabricate splitter dampers of material matching duct gage to 24 inches size in each direction, and two gages heavier for larger sizes. Secure with continuous hinge or rod. Operate with a minimum 1/4 inch diameter rod.
3. Fabricate single blade dampers for duct sizes to 12 x 30 inch.
4. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
5. Except in round ductwork 12 inches and smaller, furnish end bearings.
6. Furnish locking, indicating quadrant regulators on single and multi-blade dampers. Where width exceeds 30 inches, furnish regulator at both ends.

B. Turning Devices:

1. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.
2. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap.

C. Flexible Duct Connections:

1. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, approximately 3 inches wide, crimped into metal edging strip.

D. Duct Access Doors:

1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
2. Access doors smaller than 12 inches square secured with sash locks. Access doors with sheet metal screw fasteners are not acceptable.

E. Backdraft Dampers:

1. Manufacturers:
2. Manufacturers:
   a. Ruskin
   b. Cesco
   c. Greenheck
   d. Nailor
   e. Substitutions: Permitted.
3. Gravity back-draft dampers size 18 x 18 inches or smaller, furnished with air moving equipment, furnish of air moving equipment manufacturers standard construction.
4. Fabricate multi-blade, parallel action gravity balanced back-draft dampers of galvanized steel, or extruded aluminum, with center pivoted blades, with sealed edges, linked together, steel ball bearings, and plated steel pivot pin.

2.3 FANS

A. Ceiling Exhaust Fans:

1. Manufacturers:
   a. Loren Cook Company
   b. Acme Engineering and Manufacturing Corp.
   c. Greenheck Corp.
   d. Substitutions: Permitted.
2. Construction: The fan wheel housing and integral outlet duct shall be injection molded from a specially engineered resin exceeding UL requirements for smoke and heat generation. The outlet duct shall have provision for an aluminum backdraft damper with continuous aluminum hinge rod. The inlet box shall be minimum 22 gauge galvanized steel. Motor shall be isolation mounted to a one piece galvanized stamped steel integral motor mount/inlet. A field wiring compartment with disconnect receptacle shall be standard. To accommodate different ceiling thickness, an adjustable pre-punched mounting bracket shall be provided.
3. Grille: White aluminum grille.
4. Wheel: Centrifugal forward curved type constructed of injection molded or polypropylene resin.
5. Motor: Motor shall be totally enclosed, not ventilated (TENV) electronically commutated (EC) with permanently lubricated bearings, built-in thermal overload protection and disconnect plug. Motor shall have an adjustable speed range from 500 to 1800 rpm. Motor shall be furnished at the specified voltage.
6. Accessories:
   a. Wall cap with damper, round duct inlet.

b. Wall cap with rectangular duct inlet.

c. Roof jack constructed of corrosion resistant, galvanized steel with baked enamel finish.

d. Rubber-in-shear vibration isolator.

B. Inline Fans:

1. Manufacturers:

a. Fantech

b. Soler & Palau

c. Substitutions: Permitted.

2. Fan Unit: Fan shall be plastic, axial, inline fan tested to AMCA 210 and 300.

3. Construction: Constructed of plastic, resin material.

4. Electrical: Completely enclosed, electrical wiring box with pre-wired terminal strip connections

5. Wheel: Axial, motorized impeller and guide vanes constructed of composite material.

6. Motor: Motor shall be an electronically commutated motor rated for continuous duty and furnished either with internally mounted potentiometer speed controller or with leads for connection to 0-10 VDC external controller.

7. Accessories:

a. Backdraft damper

b. Rubber-in-shear vibration isolator.

2.4 AIR OUTLETS AND INLETS

A. Manufacturers:

1. Titus

2. Price

3. Krueger

4. Tuttle and Bailey

5. Substitutions: Permitted.

B. Ceiling Diffusers: Square, stamped or spun, multi-core type diffuser to discharge air in 360 degree pattern, with sectoring baffles where indicated; baked enamel off-white finish.

C. Sidewall Registers: Streamlined and individually adjustable blades, one-way deflection, with factory prime coat finish.

D. Return Grilles: Ceiling mounted, egg crate type.

E. Floor Grilles: Aluminum linear bar grille with fixed bars, 0° deflection, pencil proof spacing, heavy duty frame for floor applications.

F. Louvers: 4-6 inches deep with blades on 45 degree slope, channel frame, birds-screen with 0.3 inch square mesh for exhaust and 0.3 inch for intake.

1. Material: 16 gage (1.50 mm) thick galvanized steel.
2. Finish: Factory baked enamel finish, color per architect.
3. Installation: Exterior, flat flange.

2.5 FILTERS

A. Manufacturers: as provided with equipment.

B. Construction Filters: provide one extra set of filters with each piece of equipment. Replace upon completion of construction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify sizes of equipment connections before fabricating transitions.

B. Verify rated walls are ready for fire damper installation.

C. Verify ducts and equipment installations are ready for accessories.

D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.2 INSTALLATION

A. Metal Ducts: Install in accordance with SMACNA Duct Construction Standards - Metal and Flexible.

B. All longitudinal and transverse joints, seams, and connections of supply and return ducts operating at a static pressure less than 2.0” w.g. shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with manufacturer’s installation instructions.

C. Connect flexible ducts to metal ducts with liquid adhesive plus tape or draw bands.

D. Use crimp joints with or without bead for joining round duct sizes 8 inches and smaller with crimp in direction of airflow.

E. Install flexible connections immediately adjacent to fans and motorized equipment. Install flexible connections specified between fan inlet and discharge ductwork. Prevent flexible connectors being in tension while running.

F. Install backdraft dampers on discharge of exhaust fans and as indicated on Drawings.

G. Prevent passage of unfiltered air around filters by installing felt, rubber, or neoprene gaskets.

H. Cut openings in ductwork to accommodate thermometers and controllers. Cut pitot tube openings for testing of systems, complete with metal can with spring device or screw to eliminate against air leakage.

I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities. Apply duct insulation specified in Section 23 07 00.

J. During construction install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

K. Access Doors: Install access doors at the following locations and as indicated on Drawings:

1. Before and after each automatic control damper.

2. Before and after each fire damper, smoke damper and/or combination fire and smoke damper.

L. Access Door Sizes: Install minimum 12 x 12 inch size. Review locations prior to fabrication.

M. Install balancing dampers on duct take-off to diffusers and grilles and registers, regardless of whether dampers are specified as part of diffuser, or grille and register assembly.

N. Do not operate fans until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

O. Install fans with resilient mountings and flexible electrical leads.

P. Install sheaves required for final air balance.

Q. Install safety screen where fan inlet or outlet is exposed.

R. Fire and smoke dampers shall be provided with an approved means of access, large enough to permit inspection and maintenance of the damper and its operating parts. The

access shall not affect the integrity of fire-resistance-rated assemblies. Access points shall be permanently identified on the exterior by a label having letters not less than 0.5” in height reading: “FIRE/SMOKE DAMPER, SMOKE DAMPER or FIRE DAMPER. Access doors in ducts shall be tight fitting and suitable for the required duct construction.

END OF SECTION

SECTION 23 36 10

HEAT TRANSFER UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hydronic Unit heaters.

B. Electric Radiant Cove Heaters

C. Blower coils

1.2 SUBMITTALS

A. Shop Drawings: Provide for manufactured products and assemblies.

B. Product Data: Provide for manufactured products and assemblies including coil and frame configurations, and rough-in dimensions.

C. Schedules: Equipment and radiation enclosures indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.

D. Operating and Maintenance Instructions: Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.3 WARRANTY

A. Provide one year manufacturer's warranty.

PART 2 PRODUCTS

2.1 UNIT HEATERS

A. Manufacturers:

1. Trane
2. Modine
3. Sterling
4. Beacon/Morris
5. Substitutions: Permitted

B. Coils: Seamless copper tubing, 0.025 inch minimum wall thickness, brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

C. Casing: 20 gauge steel with threaded pipe connections for hanger rods.

D. Finish: Factory applied baked primer coat.

E. Fan: Aluminum blades, totally enclosed, resilient mounted motor, and fan guard.

F. Air Outlet: Horizontal single deflection louver.

G. DDC thermostat by controls contractor.

2.2 RADIANT COVE HEATERS

A. Manufacturers:

1. Ouellet
2. King Electrical
3. Markel
4. Approved equal

B. Construction: Front of the unit made of an aluminum extrusion. Back of the unit made with

18-gauge steel. Junction box on the end, wall installation brackets, 4 in. ground wires on both ends, and high-emissive paint on heat exchanger.

C. Finish: Silichem off-white, mat black, or anodized aluminum finish.

D. Heating Element: Stainless steel tubular heating element inserted into a solid aluminum extrusion preventing any thermal expansion noise.

E. Control: DDC thermostat by controls contractor.

2.3 BLOWER COIL UNITS

A. Manufacturer:

1. Trane
2. Carrier
3. Enviro-tec
4. Substitutions: Permitted

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 300 psi and 200°F.

C. Cabinet: Heavy gage galvanized steel, side access panels, glass fiber insulation.

D. Finish: Factory applied primer coat on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Electrically commutated motors.

G. Drain Pan: noncorrosive, removable for cleaning with overflow switch.

H. Control: Factory wired, DDC control, valve and thermostat by Controls Contractor.

I. Filter: Easily removed two-inch thick MERV13 glass fiber throw-away type, located to filter air before coil.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Provide drain pan and drain connection for cooling coils. Pipe drain pans to nearest floor drain.

C. Hang unit heaters from building structure, not from piping. Mount as high as possible.

D. Provide hydronic units with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. Provide float operated automatic air vents with stop valve.

E. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal.

F. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION

SECTION 23 52 00
HEATING BOILERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-tube wall mounted condensing boilers.

1.2 SUBMITTALS

A. Product Data: Submit capacities, general layout, dimensions, and size and location of water, fuel, electric and vent connections, electrical characteristics, weight and mounting loads.

B. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.4 QUALITY ASSURANCE

A. The boiler shall bear the ASME "H" stamp for 80 psi working pressure and shall be National Board listed.

B. The boiler shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard.

C. The boiler shall operate at a minimum of 94.4% Thermal Efficiency as registered with AHRI and have a 10:1 turndown.

D. The boiler shall be certified for indoor installation.

E. The boiler shall have an independent laboratory rating for Oxides of Nitrogen (NOx) to meet the requirements of South Coast Air Quality Management District in Southern California and the requirements of Texas Commission on Environmental Quality.

F. The manufacturer shall verify proper operation of the burner, all controls and the integrity of the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

G. Maintain one copy of each document on site.

1.5 WARRANTY

A. Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Fire-Tube Condensing Boilers:
      a. Heat Exchanger assembly shall have a 15 year warranty.
      b. All other components shall carry a one year warranty from date of boiler start up.

PART 2 PRODUCTS

2.1 FIRE-TUBE WALL MOUNTED CONDENSING BOILERS

A. Manufacturers:
   1. Lochinvar Corp.
   2. Laars
   3. Weil-McLain.
   4. Substitutions: Permitted.

B. Description
   1. The boiler shall be wall mounted, condensing type.
   2. The boiler shall be certified for operation at elevations of 4,500 feet, and above, by a 3rd party organization.
   3. The boiler shall be suitable for use with polypropylene glycol up to a 50% concentration. The de-rate associated with the glycol will vary per glycol manufacturer.

C. Construction
   1. Boiler shall be wall mounted.
   2. Constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides
   3. The boiler shall have a fully welded, stainless steel, fire tube heat exchanger. There shall be no banding material, bolts, gaskets or "O" rings in the pressure vessel construction. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop.
   4. The condensate collection basin shall be constructed of welded stainless steel.
   5. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal.
   6. A burner/flame observation port shall be provided for observing the burner flame and combustion chamber.
   7. The burner shall be a premix design constructed of high temperature stainless steel with a woven Fecralloy outer covering to provide smooth operation at all modulating firing rates
   8. The boiler shall be supplied with a negative pressure regulation gas valve and be equipped with a pulse width modulation blower system to precisely control the fuel/air mixture to the burner.
   9. The boiler shall operate in a safe condition with gas supply pressures as low as 4 inches of water column.

10. The burner flame shall be ignited by direct spark ignition with flame monitoring via a flame sensor.

D. Hot Water Boiler Trim:
1. ASME rated pressure relief valve set at 30 psi.
2. Pressure Gage: Minimum 3-1/2 inch diameter. Gage shall have normal operating pressure about 50 percent of full range.
3. Drain Valves: Minimum NPS 3/4 or nozzle size with hose-end connection.
4. Condensate Neutralization Kit: Factory supplied condensate trap with condensate trip sensor, high-capacity condensate receiver prefilled with appropriate medium.

E. Boiler Controls: Boiler shall have integral controls equivalent to below:
1. The boiler shall utilize a 24 VAC control circuit and components. The control system shall have a factory installed display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The BOILER shall be equipped with a temperature/pressure gauge; high limit temperature control with manual reset; ASME certified pressure relief valve set for 30 psi (standard); outlet water temperature sensor with a dual thermistor to verify accuracy; system supply water temperature sensor; outdoor air sensor, flue temperature sensor with dual thermistor to verify accuracy; low water cut off with manual reset, blocked drain switch and a condensate trap for the heat exchanger condensate drain.
2. The boiler shall feature an integral control system that is standard and factory installed with 128 x 128 resolution display, password security, outdoor air reset, pump delay with freeze protection, pump exercise, ramp delay featuring six steps, domestic hot water prioritization with limiting capabilities, USB drive for simple uploading of parameters and a PC port connection for connection to a local computer for programming and trending. A secondary operating control that is field mounted outside or inside the appliance is not acceptable. The boiler shall have alarm contacts for any failure, runtime contacts and data logging of runtime at given modulation rates, ignition attempts and ignition failures. The boiler shall have a built-in “Cascade” with leader redundancy to sequence and rotate while maintaining modulation of up to eight boilers of different Btu inputs without utilization of an external controller. The internal “Cascade” function shall be capable of lead-lag, efficiency optimization, front-end loading, and rotation of lead boiler every 24 hours. The boiler shall be capable of remote communication via optional Remote Connectivity with the capability of historical trending and sending text message or email alerts to notify the caretaker of a boiler alarm and remote programming of onboard boiler control. The control must have optional capability to communicate via Modbus protocol with a minimum of 46 readable points. The boiler shall have an optional gateway device which will allow integration with LON or BacNet protocols.
3. The integral control shall increase fan speed to boost flame signal when a weak flame signal is detected during normal operation. A 0-10 VDC output signal shall control a variable speed boiler pump (pump shall be supplied by manufacturer) to keep a fixed Delta T across the boiler regardless of the modulation rate. The boiler shall have the capability to receive a 0-10 VDC input signal from a variable speed system pump to anticipate changes in system heat load in order to prevent flow related issues such as erratic temperature cycling.
4. The boiler shall be equipped with two terminal strips for electrical connection. A low voltage connection board with 46 connection points for safety and operating controls, i.e., Alarm Contacts, Runtime Contacts, Low Water Cut Off, Louver Proving Switch, Tank Thermostat, Domestic Hot Water Building Recirculation

Pump Contacts, Domestic Hot Water Building Recirculation Temperature Sensor Contacts, Remote Enable/Disable, System Supply Temperature Sensor, Outdoor Temperature Sensor, Tank Temperature Sensor, Modbus Building Management System Signal and Cascade Control Circuit. A high voltage terminal strip shall be provided for Supply voltage. Supply voltage shall be 120 volt / 60 hertz / single phase on all models. The high voltage terminal strip plus integral relays are provided for independent pump control of the System pump, the Boiler pump and the Domestic Hot Water pump.

F. Venting:
1. Direct Vent system with vertical roof top termination of both the exhaust vent and combustion air. The flue shall be Category IV approved material constructed of PVC, CPVC, Polypropylene or Stainless Steel. A separate pipe shall supply combustion air directly to the boiler from the outside. The boiler's total combined air intake length shall not exceed 100 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 100 equivalent feet. The air inlet must terminate on the rooftop with the exhaust.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.
1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in of piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired boilers according to NFPA 54.

B. Assemble and install boiler trim.

C. Install electrical devices furnished with boiler but not specified to be factory mounted.

D. Install control wiring to field-mounted electrical devices.

E. Install boilers plumb and level, to plus or minus 1/16 inch over boiler base.

F. Maintain manufacturer's recommended clearances around and over boilers.

G. Connect natural gas piping in accordance with NFPA 54. Refer to Section 23 10 00.

H. Connect natural gas piping to boiler, full size of boiler gas train inlet. Arrange piping with clearances for burner removal and service.

I. Connect hot water piping to supply and return boiler connections. Refer to Section 23 20 00.

J. Install piping from relief valves to nearest floor drain.

K. Install circulator and diaphragm expansion tank on boiler.

L. Install boiler trim and accessories furnished loose for field mounting.

M. Install electrical devices furnished loose for field mounting.

N. Install control wiring between boiler control panel and field mounted control devices.

O. Connect flue to boiler outlet, full size of outlet.

P. Furnish manufacturer’s field representative for starting unit and training operator.

Q. Adjust burner for proper firing.

END OF SECTION

SECTION 23 64 23

AIR-COOLED SCROLL WATER CHILLERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes design, performance criteria, refrigerants, controls, and installation requirements for air-cooled rotary scroll packaged chillers.

1.2 REFERENCES

A. Comply with applicable Standards/Codes of AHRI 550/590, 2024 ASHRAE 15, UL 60335-2-40, ETL, and ISO 9001.

B. Units shall meet the efficiency standards of ASHRAE Standard 90.1, 2013.

1.3 SUBMITTALS

A. Submit dimensional plan and elevation view drawings, weights and loadings, required clearances, location and size of all field connections, electrical requirements and wiring diagrams.

B. Submit product data indicating rated capacities, accessories and any special data.

C. Submit manufacturer's installation instructions.

1.4 VERIFICATION OF CAPACITY AND EFFICIENCY

A. All proposals for chiller performance must include an AHRI approved selection method. Verification of date and version of computer program selection or catalog is available through AHRI.

1.5 DELIVERY AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting chillers.

B. Chiller shall be capable of withstanding -40ºF to 158ºF storage temperatures for an indefinite period of time.

1.6 WARRANTY

A. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Trane

B. Carrier

2.2 UNIT DESCRIPTION

A. The contractor shall furnish and install air-cooled water chiller with scroll compressors as shown as scheduled on the contract documents. The chillers shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

2.3 CHILLER OPERATION

A. Chiller shall be able to start and operate in ambient conditions from 32ºF to 125ºF. Wide ambient operation is accomplished with factory installed and tested protection. If field installed wide ambient solution is used, this shall be purchased and installed at contractor expense.

B. Chiller shall be capable of operating with a leaving solution temperature range 42ºF to 65ºF without glycol.

C. Chiller shall be capable of starting up with 95ºF entering fluid temperature to the evaporator. Maximum water temperature that can be circulated with the Chiller not operating is 125ºF.

D. Chiller shall provide evaporator freeze protection and low limit control to avoid low evaporator refrigerant temperature trip-outs during critical periods of chiller operation. Whenever this control is in effect, the controller shall indicate that the chiller is in adaptive mode. If the condition exists for more than 30 seconds, a limit warning alarm relay shall energize.

E. The Chiller shall be capable of starting in 85 seconds after power restoration and be able to attain 80% load in less than 150 seconds after power restoration.

F. Chiller shall be able to operate within 4 feet of a solid wall and/or 8 feet between two chillers side by side.

G. Chiller shall be able to operate with a 2-minute loop time for comfort cooling applications. Chiller manufacturer shall provide a buffer tank and contractor shall install at no additional cost to owner if additional loop time is required.

2.4 COMPRESSORS

A. Construct chiller using fully hermetic scroll type compressors with R454B optimized and dedicated scroll profile. Refrigerant shall have a GWP of less than 600.

B. Provide direct drive motor cooled by suction gas with only three major moving parts and a completely enclosed compression chamber that leads to increased efficiency.

C. Each compressor shall have overload protection internal to the compressor.

D. Each compressor shall include: centrifugal oil pump, oil level sight glass and oil charging valve.

E. Each compressor will have crankcase heaters installed and properly sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles.

2.5 EVAPORATOR

A. The evaporator shall be a high efficiency, brazed plate-to-plate type heat exchanger consisting of parallel plates. Braze plates shall be stainless steel with copper braze material.

B. The water side working pressure shall be rated at 150 psig and tested at 1.5 times maximum allowable water side working pressure.

C. The refrigerant side working pressure shall be rated at 460 psig and tested at 1.1 maximum allowable refrigerant side working pressure.

D. Insulate the evaporator with a minimum of 0.75 inch (K=0.28) UV rated insulation. If the insulation is field installed, the additional money to cover material and installation costs in the field should be included in the bid.

E. Evaporator heaters shall be factory installed and shall protect chiller down to -20ºF. Contractor shall wire separate power to energize heat tape and protect evaporator while chiller is disconnected from the main power.

F. Provide water drain connection, vent and fittings. Factory installed leaving water temperature control and low temperature cutout sensors.

G. Water connections shall be grooved pipe.

H. Proof of flow shall be provided by the equipment manufacturer, mechanically installed and electrically wired, at the factory of origin.

I. Factory installed cleanable strainer.

J. Pump package includes: two high head pumps, VFD, expansion vessels, drainage valves, shut-off valves at entering and leaving connections. The pump package is single point power integrated into the chiller unit power with a separate factory wired control panel. The control of the pump is integrated into the chiller controller. The chiller controller displays

evaporator pump starts and run-times. Freeze protection down to an ambient of -20ºF is included as standard. The cold parts of the pump package will also be insulated. Designed with one redundant pump, the chiller controls both pumps through a lead/lag and failure/recovery functionality. The motors shall be high efficiency, inverter-ready Totally Enclosed Fan Cooled type motors. A variable speed drive is installed in an additional panel to control the pump. The inverter is adjusted upon start up to balance the system flow and head requirements. The purpose is to save on wasted pump energy caused by a traditional balancing valve.

K. The water tank is factory-installed for easy installation at the building site. The tank is engineered for continuous flow and is fully insulated as standard and is designed with freeze protection down to -20ºF.The purpose of the tank is to increase the chilled water circuit inertia, which is necessary with short water loops. A high circuit inertia reduces the compressor's cycling to increase the compressor life span and allow for more precise water temperature accuracy. It also saves energy as compared to hot gas bypass.

2.6 FANS

A. Low sound fans shall by dynamically balanced and direct driven.

B. All condenser fan TEAO motors have permanently lubricated ball bearings and external overload protection.

2.7 CONDENSER

A. The condenser coils shall consist of copper tubes mechanically bonded into plate-type aluminum fins. A subcooling coil shall be an integral part of the main condenser coil.

B. The condenser coils shall have an integral sub-cooling circuit and shall be designed for at least 650 psig working pressure. Leak tested at 650 psig.

2.8 ENCLOSURES/CHILLER CONSTRUCTION

A. Units shall be constructed of a galvanized steel frame with galvanized steel panels and access doors.

B. Chiller panels, base rails and control panels shall be finished with a baked on powder paint. Control panel doors shall have door stays.

C. Mount starters and Terminal Blocks in a UL 60335-2-40 rated weatherproof panel provided with full opening access doors. If a circuit breaker is chosen, it should be a lockable, through-the-door type with an operating handle and clearly visible from outside of chiller indicating if power is on or off.

2.9 CHILLER MOUNTED STARTER

A. The starter shall be across-the-line configuration, factory-mounted and fully pre-wired to the compressor motor(s) and control panel.

B. Unit shall have a single point power connection.

C. A control power transformer shall be factory-installed and factory-wired to provide unit control power.

D. Control panel shall be dead front construction for enhanced service technician safety

E. Unit wiring shall run in liquid-tight conduit.

F. A molded case standard interrupting capacity circuit breaker shall be factory pre-wired with terminal block power connections and equipped with a lockable external operator handle, making it available to disconnect the chiller from main power.

G. High short circuit current rating (SCCR) with selection of high fault protection device.

2.10 REFRIGERANT CIRCUIT

A. Chillers shall have 1 refrigeration circuit, with two manifolded compressors on the circuit.

B. Provide for refrigerant circuit:

1. Liquid line shutoff valve
2. Discharge service valve

3. Filter
4. Liquid line sight glass.
5. Electronic expansion valve sized for maximum operating pressure
6. Charging valve

C. Unit shall come with full operating charge of R454B refrigerant and oil.

2.11 CONTROLS

A. Factory-mounted to the control panel door, the operator interface has a 7 inch LCD touch-screen display

B. Display shall consist of a menu driven interface with easy touch screen navigation to organized sub-system reports for compressor, evaporator, and motor information as well as associated diagnostics.

C. The chiller control panel shall provide password protection of all set-points

D. Chilled water temperature control shall be microprocessor-based, proportional and integral controller to show water and refrigerant temperature, refrigerant pressure, and diagnostics. This microprocessor-based controller is to be supplied with each chiller by the chiller manufacturer.

E. The front of the chiller control panel shall display the following in clear language, without the use of codes, look-up tables, or gauges:

1. Run time.
2. Number of starts.
3. Current chiller operating mode.
4. Chilled water set point and set point source.
5. Electrical current limit set point and set point source.
6. Entering and leaving evaporator water temperatures.
7. Saturated evaporator and condenser refrigerant temperatures.
8. Evaporator and condenser refrigerant pressure.
9. Differential oil pressure.
10. Phase reversal/unbalance/single phasing and over/under voltage protection.
11. Low chilled water temperature protection.
12. High and low refrigerant pressure protection.
13. Load limit thermostat to limit compressor loading on high return water temperature.
14. Condenser fan sequencing to automatically cycle fans in response to load, expansion valve pressure, condenser pressure, and differential pressure to optimize chiller efficiency.
15. Display diagnostics.
16. Compressors: Status (on/off), %RLA, anti-short cycle timer, and automatic compressor lead-lag.

F. On chiller, mount weatherproof control panel, containing starters, power and control wiring, factory wired with terminal block power connection. Provide primary and secondary fused control power transformer.

G. The chiller controller shall utilize a microprocessor that will automatically take action to prevent chiller shutdown due to abnormal operating conditions associated with: evaporator refrigerant temperature, high condensing pressure and motor current overload.

H. Provide the following safety controls with indicating lights or diagnostic readouts:

1. Low chilled water temperature protection.
2. High refrigerant pressure.

3. Loss of chilled water flow.
4. Contact for remote emergency shutdown.
5. Motor current overload.
6. Phase reversal/unbalance/single phasing.
7. Over/under voltage.
8. Failure of water temperature sensor used by controller.
9. Compressor status (on or off).

I. Provide the following operating controls:

1. A variable method to control capacity in order to maintain leaving chilled water temperature based on PI algorithms. Five minute solid state anti-recycle timer to prevent compressor from short cycling. Compressor minimum stop-to-start time limit shall be 2 minutes. If a greater than 5 minute start-to-start, or greater than 2 minute stop-to-start timer is included, hot gas bypass shall be provided to insure accurate chilled water temperature control in light load applications.
2. Chilled water pump output relay that closes when the chiller is given a signal to start.
3. Load limit thermostat to limit compressor loading on high return water temperature to prevent nuisance trip outs.
4. High ambient unloader pressure controller that unloads compressors to keep head pressure under control and help prevent high pressure nuisance trip outs on days when outside ambient is above design.
5. Compressor current sensing unloader chiller that unloads compressors to help prevent current overload nuisance trip outs.
6. Low ambient lockout control with adjustable setpoint.
7. Condenser fan sequencing which adjusts the speed of all fans automatically in response to ambient, condensing pressure and expansion valve pressure differential thereby optimizing chiller efficiency.

J. Provide user interface on the front of the panel. If display is on the inside of the panel, then a control display access door shall be provided to allow access to the display without removal of panels. Provide user interface with a minimum of the following features:
1. Leaving chilled water setpoint adjustment from LCD input
2. Entering and leaving chilled water temperature output
3. Pressure output of condenser
4. Pressure output of evaporator
5. Ambient temperature output
6. Voltage output
7. Current limit setpoint adjustment from LCD input.

K. The chiller control panel shall provide leaving chilled water temperature reset based upon return water temperature.

L. Digital Communications to BAS system shall consist of a BACnet MS/TP interface via a single twisted pair wiring.

M. The controller shall be capable of controlling chiller in variable applications. At flow rate changes of 10% or less per minute, controller shall maintain leaving temperature control of +/-2degF). At flow rate changes of up to 30% or less per minutes, chiller shall stay online.

2.12 SOUND

A. Acoustics: Manufacturer must provide both sound power and sound pressure data in decibels. Sound pressure data per AHRI 370 must be provided at full load.

B. If manufacturer cannot meet the noise levels, sound attenuation devices and/or barrier walls must be installed to meet this performance level.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with the manufacturer’s requirements.
   1. Level the chiller using the base rail as a reference. The chiller must be level within 1/2" in over the entire length and width. Use shims as necessary to level the chiller.

3.2 SERVICE AND START-UP

A. Startup - Provide all labor and materials to perform startup. Startup shall be performed by a factory-trained technician from the original equipment manufacturer (OEM). Technician shall confirm that equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under OEM warranty. This shall be done in strict accordance with manufacturer's specifications and requirements. Third-party service agencies are not permitted.

B. A start-up log shall be furnished by the factory approved start-up technician to document the chiller's start-up date and shall be signed by the owner or his authorized representative prior to commissioning the chillers.

END OF SECTION

SECTION 23 8123

MINI-SPLIT AIR CONDITIONERS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes single-zone, mini-split, cooling-only HVAC systems which include:

1. Outdoor, air-source cooling-only units
2. Indoor, exposed, wall-mounted units
3. HVAC system controllers
4. HVAC system refrigerant piping

1.2 SUBMITTALS

A. Product Data: Submit unit rated capacities; drain, refrigeration, and electrical characteristics; and connection requirements. Indicate physical size, weight, and raised floor air outlet size.

B. Manufacturer's Installation Instructions: Submit relevant instructions.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit recommended maintenance and spare parts list.

1.4 WARRANTY

A. Furnish a seven-year manufacturer warranty for compressors and five year warranty for parts.

PART 2 PRODUCTS

2.1 MINI SPLIT AIR CONDITIONING UNITS

A. Manufacturers:

1. Trane
2. Daikin
3. Substitutions: Permitted

B. If a manufacturer other than the basis of design (Mitsubishi/Trane) is submitted, data must be provided to show how the system will comply with 2024 ASHRAE 15 requirements. Contractor is responsible for any design modifications required to maintain ASHRAE 15 compliance with the system they submit, including but not limited to modifying natural ventilation openings, mechanical ventilation systems, or refrigerant detection systems.

C. Single-zone HVAC system(s) with variable capacity in response to varying cooling loads. System shall consist of outdoor unit, indoor unit, piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.

D. Quality Assurance:

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. AHRI Compliance: System and equipment performance certified according to AHRI 210/240-2024 and AHRI 1380.
3. UL Compliance: Comply with UL 60335-2-40.

E. Delivery, Storage and Handling

1. Unit shall be stored and handled according to the manufacturer's recommendation.

F. Indoor Unit. Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Unit Cabinet:

a. The Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.

b. Insulation: Closed-cell internal insulation to provide thermal resistance and prevent condensation.

c. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

2. Coil Assembly:

a. Coil Casing: Aluminum, galvanized, or stainless steel.

b. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

c. Coil Tubes: Copper, of diameter and thickness required by performance.

d. Unit Internal Tubing: Copper tubing with brazed joints.

e. Unit Internal Tubing Insulation: Closed-cell, of thickness to prevent condensation.

f. Factory Charge: Dehydrated air or nitrogen.

g. Testing: Factory pressure tested and verified to be without leaks.

3. Drain Assembly:

a. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
b. Condensate Removal: Provide unit with field-installed condensate pump accessory.
c. Field Piping Connection: Non-ferrous material.

4. Fan:

a. Direct-drive arrangement. Single or multiple fans connected to a common motor shaft and driven by a single motor. Fabricated from non-ferrous components or ferrous components with corrosion protection finish. Wheels statically and dynamically balanced.
b. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
c. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
d. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.

e. Vibration Control: Integral isolation to dampen vibration transmission.

5. Filter:

a. Access: Front, to accommodate filter replacement without the need for tools.
b. Media: Manufacturer's standard washable filter with antimicrobial treatment.

6. Electrical:

a. Field Connection: Single point connection from outdoor unit provides power for indoor unit and signal for integral controls.
b. Disconnecting Means: Field-installed 3-pole switch, complying with NFPA 70.

7. Control:

a. This unit shall have a wired controller to perform input functions necessary to operate the system.
b. The controller shall consist of an On-Off switch, Cool/Dry-Fan selector, Thermostat setting, Timer Mode, High-Low fan speed, Auto Vane selector, Test Run switching and Check Mode switching.
c. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and controlling the outdoor unit
d. Normal operation of the remote controller provides individual system control in which one remote controller and one indoor unit are installed in the same room.

G. Outdoor Unit. Factory-assembled and tested complete unit module designed for use in systems with all cooling demands.

1. Unit Cabinet: Galvanized steel and coated with a corrosion-resistant finish. Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

2. Fan:

a. The unit shall be furnished with either one or two direct drive propeller type fans.
b. Brushless DC or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
c. The fan motor shall be mounted for quiet operation.
d. Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for heat exchanger.
e. The outdoor unit shall have horizontal discharge airflow.
f. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

3. Coil:

a. Casing: Aluminum, galvanized, or stainless steel.
b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
c. Tubes: Copper, of diameter and thickness required by performance.

4. Compressor:

a. Positive-displacement, direct-drive and hermetically sealed rotary or scroll compressor with inverter drive. Non-inverter compressors—where LRA applies—are not allowed.
b. Protection: Integral protection against the following-
- High and low refrigerant pressure.
- High refrigerant and oil temperature.
- Thermal and overload.
- Voltage fluctuations.
- Short cycling.
c. Vibration Control: Integral isolation to dampen vibration transmission.
d. Crankcase heater.
e. Accumulator.
f. Fusible plug.
g.

5. DX Capacity Control: Electronic modulating type expansion valve with linear or proportional characteristics.
6. Operating Range: -40°F – 115°F. Provide wind baffles and all accessories required for low ambient operation.

7. Field-Installed Unit Accessories:

a. Front Wind Baffle extending minimum range for 100% cooling capacity to 0°F ambient.

b. Heat Exchanger Hail Guards

c. 18” height, Open-Design Equipment Support Stand

8. Controls: Unit has the following factory-installed sensors:

a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Compressor surface temperature.
d. Refrigerant high pressure.
e. Outdoor air temperature.
f. Outdoor coil heat sink temperature.
g. Outdoor coil two-phase pipe temperature.Features and Functions: Self-diagnostics, 3-minute time delay, auto-restart within 60 seconds after power interruption.

9. Refrigerant: R454b

10. Electrical:

a. The Field Connection: Single point connection to power each outdoor unit and integral controls.
b. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

H. Wired Controllers for Indoor Units:

1. Simple Controllers for Indoor Units:
a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature sensor
c. Temperature Units: Fahrenheit and Celsius.

d. On/Off: Turns indoor unit on or off.
e. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only.
f. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
g. Fan Speed Setting: Select between available options furnished with unit.
h. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
i. Service Notification Display: "Filter".
j. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
k. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

PART 3 EXECUTION

A. Install units to allow proper service and maintenance. Follow all manufacturer instructions when installing units.

B. Install drain piping from condensate drain pan to drain outlet fixture. Refer to Section 23 20 00 for piping material requirements. Pipe drain to nearest floor sink within the building. Provide a condensate pump when a gravity flow system is not feasible.

END OF SECTION 23 8123

NO CONTENT ON THIS PAGE

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SCOPE

A. This section includes administrative items related to submittals, permits, substitutions, owner training, project closeout, and general requirements for performance of work by the Division 26 contractor. Reference Division 1 for other requirements.

1.2 SUBMITTAL REQUIREMENTS – DIVISION 26

A. Engineer will commence review only when all Division 26 submittals have been received, due to interrelations between different sections. Review may be delayed if certain other related divisions have not been received, for example elevators or HVAC equipment.

B. Organize submittals by section and name files with section number and title.

C. All data required for review must be contained in the files provided to the Engineer. Links to manufacturer's websites will not be accepted.

D. Re-submittals must contain markups that clearly delineate the changed items. Engineer will not re-review the entire submittal package in order to find the changes.

E. Electronic submittals (pdf format) are preferred and can be reviewed faster. Paper submittals will also be accepted, but mixed format submittals are not acceptable.

F. No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.

G. The Contractor shall coordinate each submittal with the requirements of the Work and of the Contract Documents. In the event that significant deviations are necessary between the submittals and the Contract Documents, he shall notify the Engineer in writing at the time of submission.

H. The Contractor shall visit the project site, verify dimensions and existing conditions as far as possible without beginning work, and coordinate submittals accordingly. In the event that significant deviations are found between the existing conditions and the Contract Documents, he shall notify the Engineer in writing at the time of submission.

I. Engineer's review does not constitute acceptance or responsibility for accuracy of dimensions, and will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

J. Engineer's review does not relieve the Contractor of any requirements in the Contract Documents, nor shall it constitute approval of any deviation from the Contract Documents, unless such deviations are specifically stated by the Engineer in the submittal review.

1.3 PERMITS

A. Permits necessary for the performance of the work under this contract shall be secured and paid for by the Contractor. Final inspection by the Engineer will not be made or certificate of final payment issued until certificates of satisfactory inspection from the inspection authorities are delivered. Reference Division 1 for permit requirements.

1.4 TRAINING

A. The electrical contractor shall conduct a 4 hour minimum training session with owner's designated staff to review all electrical equipment installed under this contract. At a minimum, the session will include operation and maintenance, programming, and basic operation of the systems.

B. Contractor shall physically demonstrate the operation of each piece of equipment.

C. A sign in sheet and agenda indicating a list of all equipment reviewed shall be included in the close out documents.

PART 2 DIVISION 26 SCOPE

2.1 ELECTRICAL WIRING AND CONTROL EQUIPMENT

A. All line voltage wiring and conduit systems required by any Division shall be the responsibility of the Division 26 contractor. Every attempt will be made to reflect these requirements on the electrical sheets, but it is the Division 26 contractor's responsibility to obtain a complete drawing set, familiarize himself with the complete project scope, and coordinate with other Divisions.

B. Responsibilities of the Division 26 contractor include but are not limited to:

1. Installation and wiring of variable frequency drives (VFDs furnished by Division 23, startup and programming of VFDs shall be by VFD manufacturer's representative)

2. Wiring to duct smoke detectors, including signal wiring to fire alarm system

3. Wiring to fire/smoke dampers, including signal wiring and provision of disconnecting means at dampers

4. Raceways for control circuits in all Divisions

5. Field wiring of motor overload protection and starters (where required by equipment manufacturer)

6. Field wring of integral transformers in equipment (where required by equipment manufacturer)

C. The Division 26 Contractor must coordinate with the Division 23 Contractor regarding the requirements of electrical control components. Any changes or additions required due to the specific nature of equipment furnished shall be the complete responsibility of the Contractor furnishing the equipment.

D. The Division 26 Contractor must coordinate with the Division 23 Contractor to ensure that all required components of control systems are included and fully understood. The Owner shall not incur any additional cost as a result of lack of such coordination.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

A. The Contractor shall carefully examine the drawings and specifications, visit the site of the work, fully inform himself as to all existing conditions, dimensions and limitations before starting work.

B. If discrepancies are found between existing conditions and Contract Documents, Contractor shall notify Engineer for direction before proceeding. No claim for additional cost or time extension will be allowed without proper notice plus prior determination of time

and cost to the owner.

C. If existing active or non-active services (which are not shown on plans) are encountered that require relocation or disconnection, the Contractor shall notify the Engineer for a decision on proper handling of these services. The Contractor shall not proceed with the work until so authorized.

D. Damage to existing improvements caused by the contractor or a party to the contractor during the demolition or construction phase shall be repaired prior to contract date of substantial completion at no additional expense to the owner.

3.2 DEMOLITION AND MODIFICATION OF EXISTING SYSTEMS

A. The demolition plan shall be used as a schematic guide. Additional demolition may be required to complete the work indicated on the Contract Documents. If additional demolition scope is required, notify Engineer for direction before proceeding.

B. If concealed conditions are found that are of an unusual nature not ordinarily encountered in work of this kind, and these conditions will impact the cost, schedule, or design of the project, notify Engineer for direction before proceeding. No claim for additional cost or time extension will be allowed without proper notice plus prior determination of time and cost to the owner.

C. Division 26 contractor is responsible for disconnection of all electrical systems in walls, floors, and ceilings scheduled for removal in the Contract Documents.

D. Division 26 contractor is responsible for provision of temporary wiring and connections when required to maintain existing systems in service during construction.

E. Verify that all electrical equipment to be relocated or reused is in working order prior to removal. If the existing material is found to be deficient, contractor shall notify Engineer for direction before proceeding.

F. When performing work on energized equipment or circuits, use personnel experienced and trained in similar operations.

G. Coordinate with general contractor for repair of adjacent construction and finishes damaged or exposed during demolition work. Repairs shall match existing finishes, and include paint on entire wall where required to match color.

H. Unless otherwise noted in drawings, all existing removed equipment shall be stockpiled at the site at a location approved by Owner until an inspection by the Owner's representative determines what will be salvaged. All equipment not salvaged shall be properly disposed of off-site by Contractor.

I. Division 26 contractor is responsible for properly disposing of existing hazardous materials removed under Division 26, including but not limited to:

1. Fluorescent Lamps: remove from the site and properly disposing of them with a fluorescent lamp recycling company. Any used bulbs should be removed and placed in a new fluorescent lamp cardboard container. The cardboard container should be properly labeled. Boxes shall be stored and handled so that the used fluorescent lamps will not be crushed.

2. Lighting Ballasts: Inspect ballasts to be removed. Ballasts with a “No PCB” label may be disposed of as normal construction debris. Ballasts without a “No PCB” label shall be assumed to contain PCBs:

a. Non-leaking ballasts with PCBs shall be disposed of at a landfill that will accept them. If no such landfill is available, treat as leaking below.

b. Leaking ballasts shall be transported off-site by a PCB transporter to an EPA-approved chemical processing site.

3.3 PERFORMANCE OF NEW WORK

A. Provide, install, and coordinate all Division 26 work indicated by Contract Documents. This consists of furnishing all labor, equipment, supplies and materials in addition to performing all operations including cutting, channeling and underground trenching, back fill and tamping necessary for the installation of complete power, lighting, or other systems as shown.

B. Perform all electrical work in a neat and workmanlike manner in full compliance with all applicable, adopted codes; including, but not limited to: the national electrical code (NEC), UBC, IBC, NFPA, and ADA. all local and state requirements will be observed during the performance of this work.

C. If any if discrepancies are found between Contract Documents and any associated legal or safety requirements, Contractor shall notify Engineer in writing. The Engineer will modify the Contract Documents as required. If the Contractor proceeds with any work he knows to be in variance of legal or safety requirements, the Contractor will assume all responsibility for this work. He will promptly correct the work when notified, without additional cost to the Owner.

D. Coordinate all phases of the electrical work with the Architect and General Contractor. Schedule work to minimize disruption and inconvenience to the Owner.

E. Obtain from system suppliers all wiring diagrams for all equipment and ensure that manufacturer’s electrical requirements are met. Any incorrect wiring or devices installed by Contractor without the wiring diagram shall be corrected at Contractor's expense.

F. Obtain permission from Structural Engineer before drilling or cutting structural members.

G. Contact utility companies (power, gas, water, sewer, telephone, cable tv, etc.) prior to trenching in order to identify underground utilities. Contractor shall locate secondary service feeders, underground electrical branch circuits, sprinkler lines, etc., prior to trenching. Any cut or damaged underground utilities shall be repaired or replaced at Contractor's expense.

H. When installing service equipment or metering equipment, coordinate with utility company to ensure that their standards are being met. If any discrepancy is found between utility standards and Contract Documents, notify Engineer for direction.

I. Coordinate exact locations of electrical components and connections:

1. Where devices are shown in casework, coordinate exact locations with architectural casework details prior to rough-in.

2. Verify final locations of all sinks with the plumbing contractor prior to rough-in of nearby electrical devices. Any above counter electrical devices found within 8” of a sink, and any disposal receptacles found outside the under-sink space, shall be relocated at electrical contractor's expense.

3. The owner reserves the right to relocate any electrical device up to a distance of 12", prior to installation, without additional charge.

4. Coordinate the exact location of equipment requiring electrical connections with other trades prior to rough in. Where there is a question of adequate clearance or coordination between trades, Contractor will submit dimensioned drawings for Engineer's review prior to rough in.

3.4 ELECTRICAL PROJECT CLOSE OUT REQUIREMENTS

A. Before substantial completion can be granted, the following items must be completed:

1. AHJ inspection shall be completed and work approved
2. All Division 26 equipment shall be installed and connected
3. All Division 26 systems shall be online, tested, adjusted and calibrated
4. Engineer's substantial completion inspection shall be performed

B. Prior to consideration of Final Payment, the Contractor shall:

1. Provide typed panel directories installed in each panelboard. Directories shall not be printed from drawings unless all circuiting is identical to that shown in drawings.
2. Have all electrical equipment labeled per requirements in 26 05 53
3. Provide Record As-Built Drawings to Engineer. As-Built Drawings shall consist of clear, legible markups of the Contract Documents indicating the following:
    a. Any installed circuiting that deviates from circuiting on plan
    b. Any equipment size or locations that deviate from plan
    c. Any other significant deviations from design
4. Provide copies of permits and/or inspection certificates.
5. Provide Operating and Maintenance Manual(s).
6. Return keys to the Owner.
7. Deliver all spare parts.
8. Touch up any damaged finishes.
9. Clean all affected electrical equipment and systems as needed to remove construction debris such as paint, dust, grease, etc.
10. Remove all existing equipment labels that are no longer accurate.

END OF SECTION 26 0500

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes building wire and cable, conduit and tubing, surface raceway, boxes, wiring devices, wiring connectors, and connections.

1.2 SYSTEM DESCRIPTION

A. Wiring Products:
1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
2. Stranded conductors for control circuits.
3. Conductor not smaller than 12 AWG for power and lighting circuits.
4. Conductor not smaller than 16 AWG and stranded conductors for control circuits.
5. Increase wire size in branch circuits to limit voltage drop to a maximum of 2 percent.

B. Wiring Methods:
1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation.
2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation.
3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation.
4. Wet or Damp Interior Locations: Use only building wire, Type THWN insulation in raceway, or PVC jacketed armored cable as allowed below under raceway products.
5. Exterior Locations: Use only building wire, Type THWN XHHW insulation in raceway, or direct burial cable service- entrance cable, armored cable, or metal clad cable.
6. Underground Locations: Use only building wire, Type THWN insulation, in raceway.

C. Conductor sizes are based on copper. Aluminum conductors only as indicated by “AL”. Conductors shall not be substituted without written approval from the Engineer.

D. Raceway and boxes shall be located as indicated on Drawings, and at other locations where required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.

E. Use hinged enclosures for large pull boxes.

F. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

G. Raceway Products:
1. Concealed Dry Locations - Home Runs over 20 Amps:

Use rigid steel and aluminum conduit, or electrical metallic tubing. Use sheet-metal boxes.

2. Concealed Dry Locations - Branch Wiring and Home Runs 20 Amps or Less:
   Use rigid steel and aluminum conduit, electrical metallic tubing, or metal clad cable. Use sheet-metal boxes.
3. Exposed Dry Locations (all ampacities):
   Use rigid steel and aluminum conduit, electrical metallic tubing. Use sheet-metal boxes. Use flush mounting outlet boxes in finished areas.
4. Wet Interior Locations (ie, crawl spaces) - Home Runs over 20 Amps:
   Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use nonmetallic boxes.
5. Wet Interior Locations - Branch Wiring and Home Runs 20 Amps or Less:
   Use rigid steel conduit, nonmetallic conduit rated for the environmental conditions, or PVC jacketed armored cable. Use nonmetallic boxes.
6. Underground More than 5 Feet outside Foundation Wall:
   Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use cast metal boxes or nonmetallic handhole.
7. Underground Within 5 Feet outside Foundation Wall:
   Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use cast metal boxes.
8. In or Under Slab on Grade:
   Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use cast metal boxes.
9. Exposed Outdoor Locations:
   Use rigid steel conduit. Use cast metal outlet, pull, and junction boxes.

H. Minimum Raceway Size: 1/2 inch unless otherwise specified.

PART 2 PRODUCTS

2.1 SURFACE METAL RACEWAY

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Wiremold
   2. Equal

B. Product Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway, with manufacturer’s standard Ivory enamel finish. Furnish manufacturer's standard accessories; match finish on raceway.

2.2 SURFACE NONMETALLIC RACEWAY

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Wiremold
   2. Equal

B. Description: Plastic channel with fitted cover, suitable for use as surface raceway, with manufacturer’s standard finish. Furnish manufacturer's standard accessories, finish to match raceway.

2.3 WIREWAY

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Square D
2. Equal

B. Product Description: General purpose or Raintight type wireway with screw cover and manufacturer's standard enamel finish.

2.4 WALL SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

B. Single Pole Switch:
1. Hubbell, Model 1221.
2. Leviton, Model 1221.2.
3. Eagle, Model 1221.

C. Double Pole Switch:
1. Hubbell, Model 1222.
2. Leviton, Model 1222I.
3. Eagle, Model 1222.

D. Three-way Switch:
1. Hubbell, Model 1223.
2. Leviton, Model 1223.2.
3. Eagle, Model 1223.

E. Four-way Switch:
1. Hubbell, Model 1224.
2. Leviton, Model 1224.2.
3. Eagle, Model 1224.

F. Key Switch, Single Pole:
1. Hubbell, Model 1221.2L.
2. Leviton, Model 1221.2L.
3. Eagle, Model 1221.2L.

G. Key Switch, Three-Way:
1. Hubbell, Model 1223.2L.
2. Leviton, Model 1223.2L.
3. Eagle, Model 1223.2L.

H. Indicator Switch:
1. Hubbell, 1221.L.
2. Leviton, 1221.LH
3. Eagle, 1221.L.

I. Description: NEMA WD 1, heavy duty, AC quiet wall switch.

I. Color: per architect

J. Current Rating: 20 amperes.

K. Ratings: Match branch circuit voltage and load characteristics.

2.5 WALL DIMMERS-NA (see Section 26 09 23)

2.6 RECEPTACLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

B. Duplex Convenience Receptacle:
1. Hubbell, Model 5362.
2. Leviton, Model 5362.
3. Eagle, Model 5362.

C. GFCI Receptacle:
1. Hubbell, Model GF 5362
2. Leviton, Model 6899
3. Eagle, Model GF 5362

D. TR (Tamper Resistant) Receptacle:
1. Hubbell : DRS 15GRYTR
2. Hubbell : GF 82 GYTR (GFCI)
3. Equal

E. Color: per architect.

2.7 WALL PLATES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

B. Decorative Cover Plate:
1. Hubbell.
2. Leviton.
3. Approved equal.

C. Jumbo Cover Plate:
1. Hubbell.
2. Leviton.
3. Approved equal.

D. Weatherproof Cover Plate: Gasketed cast metal plate with hinged and gasketed device cover.

2.8 FLOOR MOUNTED SERVICE FITTINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following

B. Flush Cover Outlet:

1. Walker, Model 853, 860CP carpet plate.
2. Hubbell, Model B-2537, Box S-3425 cover, S-3082 carpet plate.
3. Steel City, Model 664 or 665 Box, 669 or 665-CST color, cover.
4. Material: Brass.
5. Configuration: Concealed service with carpet flange.

C. Flush Cover Combination Outlet:
1. Walker RFB4 Box, RAKM III Cover.
Approved equal
2. Material: Brass.
3. Configuration: Concealed service with carpet flange.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Remove exposed abandoned raceway, boxes, wire, and cable, including abandoned raceway and cable above accessible ceiling finishes.

B. Disconnect abandoned circuits and remove raceway, wire, and cable. Remove abandoned boxes when associated wire and cable is removed.

C. Maintain access to existing boxes and wiring connections remaining active and requiring access.

D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.

3.2 INSTALLATION

A. Route raceway and cable to meet Project conditions.

B. Use 10AWG conductors for 20 ampere branch circuits longer than 100 feet, unless otherwise specified on drawings.

C. Pull all conductors into raceway at same time.

D. Do not rest cable on ceiling grid panels.

E. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape un-insulated conductors and connector with electrical tape to 150% of insulation rating of Conductor.

F. Verify continuity of each branch circuit conductor.

G. Arrange supports to prevent misalignment during wiring installation

H. Group related conduits and support using conduit rack. Construct using steel channel and provide space on each for 25% additional conduits.

I. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers and split hangers

J. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports. Do not attach conduit to ceiling support wires.

K. Route all conduits parallel and perpendicular to structure.

L. Route conduit in and under slab from point-to-point. Do not cross conduits in slab.

M. Maintain 12 inches between conduit and surfaces with temperatures exceeding 104°F.

N. Install no more than equivalent of three 90-degree bends between boxes.

O. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

P. Provide #200 nylon pull string in each empty conduit except sleeves and nipples.

Q. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

R. Mount raceway channel plumb and level.

S. Set wall mounted boxes at elevations to accommodate mounting heights indicated

T. Adjust box location up to 10 feet prior to rough-in when required to accommodate intended purpose.

U. Do not install flush mounting box back-to-back in walls; install boxes with minimum 24 inches separation.

V. Verify outlet and switch boxes are installed at proper heights meeting ADA requirements.

W. Do not install switches behind door swings.

X. Install switches with OFF position down.

Y. Do not share neutral conductors between circuits unless specifically allowed in design drawings.

Z. Install receptacles with grounding pole on bottom.

AA. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

BB. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, and above accessible ceilings.

CC. Operate each wall switch with circuit energized and verify proper operation.

DD. Verify that each receptacle device is energized and Test each receptacle device for proper polarity.

EE. Test each GFCI receptacle device for proper operation.

FF. Do not install flush mounting box back-to-back in walls. Provide a minimum of six inches of separation. Provide a minimum of 24 inches of separation in acoustic rated walls.

GG. Coordinate mounting heights and locations of outlets mounted above counters, benches and back splashes.

HH. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

II. Use tamper resistant receptacle types in all school spaces where children are present (classrooms, media centers, restrooms, corridors, etc).

END OF SECTION 26 0519

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 SUBMITTALS

A. Action submittals: Product Data for each type of product.

B. Closeout Submittals: As part of As-Built Plans required by Section 26 05 00, show built locations of grounding features, including the following where applicable:

a. Test wells.
b. Ground rods.
c. Ground rings.
d. Grounding connections for separately derived systems.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location, environmental conditions, and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Grounding and bonding conductor sizes: As specified in Contract Drawings, or larger.

B. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

C. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

2.3 CONNECTORS

A. All grounding and bonding connectors: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors:

1. Mechanical type, cast silicon bronze, solderless compression or exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Compression type, copper or copper alloy, with two wire terminals.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy.

I. Straps: Solid copper, cast-bronze clamp or copper lugs. Rated for 600 A.

J. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

K. Water Pipe Clamps:

1. Mechanical type, two pieces with zinc-plated or stainless-steel bolts. Tin-plated aluminum or Die-cast zinc alloy, listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; size and spacing per Construction Drawings.

B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Bury at least 24 inches (600 mm) below grade.

C. Grounding Bus (if specified in Construction Drawings): Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
3. Connect to service grounding electrode.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install wire-type equipment grounding conductors with all feeders and branch circuits.

B. Conduit or cable sheath is not allowed to be used as an equipment grounding conductor, unless explicitly called for or allowed in a particular location on Construction Drawings.

C. Where current carrying conductors are increased in size to mitigate voltage drop, the wire type equipment grounding conductor must also be increased by the same percentage in cross sectional area (per NEC 250).

D. Patient Care Areas (where applicable) meet grounding requirements of NFPA 99 and NFPA 70.

E. Poles Supporting Outdoor Lighting Fixtures:

1. If the pole structure is supplied by only a single branch circuit, a separate grounding electrode (rod) is not required. Bond the equipment grounding conductor of the supply circuit to pole base rebar and exposed metallic pole components.
2. If the pole structure is supplied by multiple branch circuits, install an 8 ft ground rod at the pole, and bond to pole base rebar, exposed metallic pole components, and equipment grounding conductors of all supply circuits.
3. If the above is not possible due to site conditions, contractor shall submit RFI to Engineer for direction. Owner shall not be responsible for any added cost incurred if alternate grounding strategies are installed without Engineer’s direction.

3.3 FENCE GROUNDING

A. Fences enclosing transformers, generators, or solar/wind generation equipment: bond to the grounding electrode(s) associated with the equipment.

B. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code (for example, equipment grounding conductors for circuits must follow the same path as the circuit). Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System (where applicable): Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Interconnect ground rods with conductors below grade unless otherwise indicated. Make connections without exposing steel or damaging coating if any.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building (if present). Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. If dielectric fittings are present in interior piping, submit RFI for direction before bonding.
4. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. For all grounding connections: inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. At each location where a maximum ground-resistance level was specified on Construction Drawings: test ground resistance and provide test report to Engineer as part of Closeout Documents.

a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural

drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

c. If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce resistance.

END OF SECTION 26 0526

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

C. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified"
2. Component Importance Factor: 1.5.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-(10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Plain steel.
3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.
4. NECA 105.
5. NECA 111.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 26 0529

SECTION 26 05 33

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels and Signs.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Paint for identification.
7. Cable Ties and fasteners for labels and signs.

1.2 IDENTIFICATION REQUIRED

A. EQUIPMENT:

1. Voltage designation for each piece of electrical distribution equipment.
2. Nameplate for each piece of electrical distribution equipment, using name as shown on Construction Drawings.
3. Nameplate for each piece of control equipment, indicating system and function.
4. Emergency instructions or warning labels as specified in Construction Drawings, or required by Authority Having Jurisdiction.

B. RACEWAYS:

1. Identify all conduit runs longer than 6 feet.
2. Install bands at changes in direction, at penetrations of walls and floors (each side), at junction boxes and terminations, and straight runs.
3. Identification spacing: at 50-foot (15-m) maximum intervals in straight runs, and at 20-foot (7.6-m) maximum intervals in congested areas.

C. UNDERGROUND:

1. Install underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

D. BOXES:

1. Identify the covers of each junction and pull box with voltage, circuit number, and emergency power designation where applicable.

E. CONDUCTORS:

1. Identify each power conductor at panelboard gutters, pull boxes, and outlet and junction boxes.

2. Identify each control-circuit conductor in pull and junction boxes, manholes, handholes, and terminations, with the conductor or cable designation, origin, and destination.

F. WORKING SPACE: In unfinished and utility spaces only, apply floor marking tape or tape and stencil to finished surfaces showing working clearances, labeled “KEEP CLEAR”. Workspace shall comply with NFPA 70.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PRODUCT PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and NFPA 70E.

B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Temperature Change: 100 deg F (67 deg C), ambient; 150 deg F (100 deg C), material surfaces.

2.2 PRODUCT COLOR AND LEGEND REQUIREMENTS

A. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Color for Neutral: White or gray.
4. Color for Equipment Grounds: Bare copper, Green, Green with a yellow stripe.
5. Colors for Isolated Grounds: Green with white stripe.

B. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

C. Equipment Identification Labels:

1. Black letters on a white field, or vice versa.

2.3 LABELING PRODUCTS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.

D. Self-Adhesive Labels: Polyester, Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches (37 by 150 mm)for raceway and conductors.
b. 3-1/2 by 5 inches (76 by 127 mm)for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBE PRODUCTS

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameter and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.

2.5 TAPE AND STENCIL PRODUCTS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and is 12 inches (300 mm) wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white or yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
4. Color and Printing:

    a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
    c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

5. Tape Product :

    a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility where required, compounded for direct-burial service.
    b. Width: 4 inches (75 mm).
    c. Overall Thickness: 5 mils (0.125 mm).
    d. Foil Core Thickness: 0.35 mil (0.00889 mm).
    e. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
    f. Tensile according to ASTM D 882: 70 lbf (311.3 N) and 4600 psi (31.7 MPa).

F. Stenciled Legend: In nonfading, waterproof, high contrast ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.6 TAG PRODUCTS

A. Write-on Tags:

1. Polyester Tags: 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags:

    a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
    b. Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGN PRODUCTS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs,punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Minimum Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches (250 by 360 mm).

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

    a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
    b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
    c. Engraved legend with black letters on white face or white letters on a dark gray background.
    d. Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting, or self-adhesive where suitable for environment.
    e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIE PRODUCTS

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Vinyl Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

N. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

O. Self-Adhesive Labels:

1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

P. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

Q. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

R. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

S. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

T. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

U. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

V. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

W. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using cable ties (UV-stabilized if outdoor, or plenum-rated if in plenum).

X. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

Y. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

Z. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

AA. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION METHODS

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 20 A: Identify with self-adhesive raceway labels or vinyl tape applied in bands.

D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags or self-adhesive wraparound labels.

E. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes or self-adhesive wraparound labels.

F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels, Baked-enamel warning signs or Metal-backed butyrate warning signs.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment.
3. Install labels straight and level.

G. Arc Flash Warning Labeling: Self-adhesive labels.

H. Emergency Operating Instruction Signs: Self-adhesive labels, Baked-enamel warning signs, Metal-backed butyrate warning signs, Laminated acrylic or melamine plastic signs. White legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer load shedding Insert emergency operations.

I. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label, Baked-enamel signs, Metal-backed butyrate signs, Laminated acrylic, or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign or Stenciled legend 2 inches (50 mm) high or more.

3. Install labels straight and level.

END OF SECTION 26 0553

SECTION 26 09 26

LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

A. The products specified in this section shall constitute a complete lighting control system as described on the Drawings.

B. The intent of these specifications is to provide a complete, functional, lighting control system for the control of lighting fixtures specified on the Drawings, including any dimming technologies needed for those fixtures.

C. Where shown on the drawings, the contractor shall furnish and install a lighting control system consisting of, but not limited to, panels with relays, graphic user interfaces, controllers, enclosures, switch stations, photo sensors, occupancy sensors, low voltage Class 2 wiring for input devices and data wiring between master and secondary panels as required for a complete, operable lighting control system.

1.3 SUBMITTALS

A. Manufacturer shall provide submittal drawings and data for approval prior to beginning manufacture of equipment in electronic pdf format.

B. Submittal package shall include, but not be limited to, the following. Submittals that do not contain all the information listed below will not be considered for approval.
   1. Bill of Materials: Provide as part of the submittal package a detailed itemized listing of all proposed equipment, including quantities and capacities for all major system components.
   2. Product Data Sheets: Provide as part of the submittal package detailed product data sheets for all major system components.
   3. Shop Drawings: Submittal shall include shop drawings that accurately represent the system or systems specified herein. Shop drawings shall include the name of the project, quantity and physical dimensions of all major system components, locations of all devices on a building floorplan with legend, wire sizes and counts for all required connections between system components.
   4. Contractor/Commissioning Worksheet – must be completed prior to factory start-up.

1.4 QUALITY ASSURANCE

A. Factory Assembly: All devices shall be factory assembled and tested. All system components shall arrive at the job site completely pre-wired and ready for installation, requiring only the connection of lighting circuits and control terminations. All connections shall be made to clearly and permanently labeled termination points.

B. Component Testing: All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per specifications prior to shipment.

C. NEC Compliance: All system components shall comply with all applicable sections of the National Electrical Code (NEC) as required.

D. NEMA Compliance: All system components shall comply with all applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

E. FCC Emissions: All applicable equipment shall comply with FCC emissions standards specified in Part 15, sub-part j for commercial and residential applications and shall bear labels indicating compliance testing. Equipment the does not meet these standards shall not be acceptable.

F. All applicable products must be ETL or UL Listed or other acceptable national testing organization.

G. Title 24: Not applicable.

1.5 PROJECT CONDITIONS

A. Do not install equipment until the following conditions can be maintained in the spaces where equipment is to be placed:
   1. Ambient temperature: 0° to 40° C (32° to 104° F).
   2. Relative humidity: Maximum 95 percent, non-condensing
   3. Lighting control system must be protected from dust during installation.

1.6 WARRANTY

A. All devices in lighting control system shall have a 5 year manufacturer’s warranty.

B. Warranty period shall begin after the completion of the installation and the system’s start-up and training, the point at which the system owner receives beneficial use of the control system or 1 year after shipment from the manufacturer, whichever occurs first.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All components of the lighting system shall be from the same manufacturer, unless pre-approved by the Engineer. Pre-appoval requests shall include an explanation of why the proposed component could not be sourced from the same manufacturer, and how compatibility will be assured.

B. Complete systems from the following manufacturers may be provided without prior approval. Other manufacturers must be pre-approved.
   1. Wattstopper
   2. Leviton
   3. Greengate
   4. Lutron
   5. Acuity Brands Inc

6. Douglas Lighting Controls
7. Hubbell Building Automation

2.2 SYSTEM REQUIREMENTS

A. Low voltage input devices including occupancy/vacancy sensors, daylight sensors and switch stations shall be connected to the panel (or room controller, per drawings) and software assignable to any type. Power and control for LED indication at switch stations shall be provided.

B. Panel shall be capable of automatic recognition of relay types when relays are mixed or changed in the panel. Systems requiring programming of relay types shall not be acceptable.

C. User interface shall be LCD display. Home Screen display shall include real time clock display including Hours/Minutes/Seconds, Time Zone, Date with Day of the week.

D. System shall have an intuitive and easy to use Graphical User Interface (GUI) to control, monitor and schedule individual devices or groups of devices.

E. System shall remain fully functional during the programming process. Lighting control systems that must be taken “OFF LINE” for programming are not acceptable. All programming changes shall take effect immediately as they are programmed.

2.3 PANELS

A. Panels shall be factory assembled fully populated with a single relay type or with no relays installed for field installation of relays in less than a full panel or combinations of relay types. Panels shall be capable of having mixed types of relays installed in any slot or combination without any programming to assign relay type.

B. Panels shall provide input power leads to accommodate voltage indicated on Drawings.

C. Panel housing shall be NEMA 1 surface or recessed mounting, as shown on Drawings. The cabinet shall have a hinged door and be provided with a locking mechanism. The user interface is integral with the door for access with the cabinet locked.

D. Panel firmware and programming shall be stored in non-volatile memory and shall be unaffected by loss of power events. The system clock shall be provided with battery back-up that will remain acculturate for a minimum of 5 years. Panel system diagnostics shall be provided to check battery performance.

E. Each lighting control relay shall include a manual override means of turning the relay ON or OFF without the panel controller connected or operational. Each lighting control relay shall include an LED visual indicator showing the current status of the relay itself.

F. Interface with BAS (Building Automation System) for HVAC: Provide hardware and software to enable the BAS for HVAC to monitor, control, display, and record data for use in processing reports.

1. Hardwired Points:

a. Monitoring: On-off status.

b. Control: On-off operation.

2.4 TIMING UNIT:

A. 365-day calendar, astronomical clock, and automatic adjustments for daylight savings and leap year.

B. Clock configurable for 12-hour (a.m./p.m.) or 24-hour format.

C. 16 independent schedules, each having 24 time periods.

D. Schedule periods settable to the minute.

E. Day of week, day of month, day of year with one-time or repeating capability.

F. 32 special date periods

2.5 PANEL PROGRAMMING CAPABILITIES

A. The Panel shall have the following System Settings capabilities:
1. Date/Time Settings: System shall allow time setting of hours/minutes/seconds. Date and Time shall display continuously on the panel home screen.
2. Daylight Savings Time: Automatically adjusts the clock at the appropriate calendar dates standard, with manual date adjustment.
3. System shall provide for naming of Panels, Relays, Groups, Schedules, Holidays, Inputs, Outputs.
4. Panel shall have after hours sweep function that allows for relays to be swept off based on a designated start time (Clock Time or Open/Close Time) with up to four sweeps with intervals of 1-120 minutes.
5. Panels shall provide blink/alert capabilities before the schedule OFF event. Override duration may be selected from 1-120 minutes. Blink/warn recur if lights are still on at the end of the override duration.
6. Panels shall be capable of setting relays to be ON, OFF or return to the LAST state upon return of power after a loss of power event.

B. Inputs: Inputs shall be software assigned to any device input including motion sensors, switches, and photocells.

C. If called for on Drawings, dry contact low voltage inputs and outputs shall be provided on panels for use in initiating signals to and from the control panels to outside building systems.

D. The Panel shall provide System Tools as follows:
1. System Status: View ON/OFF states of all relays, groups, inputs and outputs. View actual sunrise/sunset time for the current date.
2. Save/Restore Programming: The system shall allow for programming to be saved to portable memory device. The system shall also allow for saving 2 back-up programs to non-volatile memory without the use of removable memory.
3. Diagnostics: On-board diagnostics for battery, panel and relay communications
4. Firmware update, controller version information, and system reboot functions
5. System event logging to SD Card

2.6 OCCUPANCY SENSORS

A. For each space indicated on the Drawings to have occupancy sensing, provide sensors of the mounting type described. Based on coverage pattern of proposed sensor, provide quantity of sensors necessary for complete coverage of space.

B. Sensor locations and quantities shown on Drawings are approximate only. In shop drawings, show locations for all proposed sensors. Locations shall consider possible obstructions, and minimize the probability of being tripped by passers-by in adjacent spaces such as corridors.

2.7 SWITCH STATIONS

A. Switches shall be injection molded and designed to mount in a standard single gang junction box with standard decorator-style plate opening.

B. Networked Switches shall have removable buttons for field replacement. Button replacement may be completed without removing the switch from the wall.

C. Switches with LED indication shall have an LED that is illuminated when the switch is in the ON state.

D. Networked Switches shall be programmable from the Panel user interface.

E. Networked Switches may be programmed for active and inactive times using the Panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All equipment shall be installed in accordance with manufacturer requirements and in compliance with all applicable local and national codes and requirements.

3.2 SITE VERIFICATION

A. Verify all wiring conditions installed under separate sections at the time of Panel installation as acceptable to and in accordance to the manufacturer’s installation instructions supplied with the products.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

C. Create a directory to indicate loads served by each circuit; incorporate Owner's final room designations. Obtain approval before installing. Use a computer to create directory; handwritten directories are unacceptable.

D. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD MEASUREMENTS

A. The electrical contractor shall be responsible for field measurements and coordination of physical size as appropriate for the product location. The electrical contractor shall coordinate with all architectural requirements for the space that the panel is located.

3.5 INSPECTION

A. The electrical contractor shall inspect all materials prior to installation and notify the manufacturer of any unacceptable materials prior to installation.

3.6 SITE PROTECTION

A. Contractor shall protect installed product and finished surfaces from damage during all phases of construction including storage, preparation, testing, and cleanup

3.7 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within [two] <Insert number> years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

C. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.8 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be programmed and commissioned by the manufacturer’s factory authorized representative who will verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.

C. Upon completion of the system commissioning, the factory-authorized technician shall provide the proper training to the owner’s personnel on the adjustment and maintenance of the system.

END OF SECTION 26 0926

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Include evidence of NRTL listing for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

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. Comply with NEMA PB 1.

D. Comply with NFPA 70.

E. Enclosures: Flush, and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.

2. Height: 84 inches (2.13 m) maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

F. Incoming Mains Location: Bottom.

G. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.

3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

I. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

J. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

K. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 POWER PANELBOARDS

A. Manufacturers
1. Square D
2. Siemens
3. Eaton
4. ABB
5. GE

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

G. Branch Overcurrent Protective Devices: Fused switches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers
1. Square D
2. Siemens
3. Eaton
4. ABB
5. GE

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: lugs only.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers
1. Square D
2. Siemens
3. ABB
4. GE

B. MCCB: Comply with UL 489, with series-connected rating to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.

e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:

1) Instantaneous trip.
2) Long- and short-time pickup levels.
3) Long and short time adjustments.
4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

2.6 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NECA 407.

C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box.

E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

H. Install filler plates in unused spaces.

I. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-EMT) empty conduits into raised floor space or below slab not on grade.

J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 2416

SECTION 26 43 13

SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

A. SPDs: Comply with UL 1449, Type 1.

1. SPDs with the following features and accessories:

a. Integral disconnect switch.

b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

c. Indicator light display for protection status.

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

C. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.

2. Line to Ground: 1200 V for 480Y/277 V.

3. Line to Line: 2000 V for 480Y/277 V.

D. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.

2. Line to Ground: 700 V

3. Line to Line: 1000 V.

E. SCCR: Equal or exceed 200 kA

F. Inominal Rating: 20 kA.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Complete startup checks according to manufacturer's written instructions. Energize SPDs after power system has been energized, stabilized, and tested.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.

2. Inspect anchorage, alignment, grounding, and clearances.

3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 26 4313

NO CONTENT ON THIS PAGE

SECTION 26 51 19

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of LED luminaires:

1. Cylinder.
2. Downlight.
3. Lowbay.
4. Recessed linear.
5. Strip light.
6. Surface mount, linear.
7. Surface mount, nonlinear.
8. Suspended, linear.
9. Suspended, nonlinear.
10. Materials.
11. Finishes.
12. Luminaire support.

B. Related Requirements:
1. Section 260926 "Lighting Control Panelboards" for panelboards used for lighting control.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, arranged by designation.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved:

B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

C. Product Certificates: For each type of luminaire.

D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified**.** "

2.2 LUMINAIRE 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. Standards:

1. ENERGY STAR certified.
2. California Title 24 compliant.
3. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
4. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
5. UL Listing: Listed for damp location.
6. Recessed luminaires shall comply with NEMA LE 4.

C. Rated lamp life of 35,000 hours to L70.

D. Lamps dimmable from 100 percent to 0 percent of maximum light output.

E. Internal driver.

F. Nominal Operating Voltage: 120 V ac.

1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

2.3 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers, and Globes:
1. Acrylic: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm)

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports: Sized and rated for luminaire weight.

E. Flush-Mounted Luminaire Support: Secured to outlet box.

F. Wall-Mounted Luminaire Support:
1. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

J. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION – 26 5119

SECTION 26 56 00

EXTERIOR LIGHTING SUPPORTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Luminaire poles and mounting accessories.

B. Related Sections include the following:
1. Section 26 51 19 "LED Lighting Fixtures" for interior and exterior luminaire requirements.

1.3 DEFINITIONS

A. Luminaire: Complete lighting fixture, including ballast housing if provided.

B. Pole: Luminaire support structure, including tower used for large area illumination.

C. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4.

B. Live Load: Single load of 500 lbf , distributed as stated in AASHTO LTS-4.

C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4.

D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.
1. Wind speed for calculating wind load for poles exceeding 50 feet in height is 80 mph.
2. Wind speed for calculating wind load for poles 50 feet or less in height is 80 mph.

1.5 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.

4. Luminaire materials.
5. Photoelectric relays.
6. Ballasts, including energy-efficiency data.
7. Materials, dimensions, and finishes of poles.
8. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
9. Anchor bolts for poles.11.
10. Pole foundations.
11. Design data, include IES files for all fixture types.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70E and IEEE C2, "National Electrical Safety Code."

C. Comply with NFPA 70. National Electrical Code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
   1. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
   2. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.
   1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
   2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
   1. Materials: Shall not cause galvanic action at contact points.
   2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
   3. Anchor-Bolt Template: Plywood or steel.

D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete" or in structural/civil details. Grout around each base.

E. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

F. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4.

2.2 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; 1-piece construction up to 40 feet in height with access handhole in pole wall.
   1. Shape: Round, straight.
   2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Steel Mast Arms: Single-arm type, continuously welded to pole attachment plate. Material and finish same as pole.

C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
   1. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.
   2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
   3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.]

F. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch handhole located at midpoint of pole with cover for access to internal welded attachment lug for electric cable support grip.

G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

I. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

J. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.

K. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.

3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: As selected by Architect from manufacturer's full range.

2.3 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429, Alloy 6063-T6 with access handhole in pole wall.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Valmont Square, 4- Bolt Poles.
2. Shape: Square, straight.
3. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.
1. Finish: Same as pole.

F. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

G. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

2.4 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

PART 3 EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Fasten luminaire to indicated structural supports.
1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

B. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources.

C. Provide excavation and concrete foundation for lighting poles.

3.2 POLE INSTALLATION

A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:
1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 03 Section "Cast-in-Place Concrete" or structural/civil details.

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers, unless otherwise indicated.
4. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
1. Dig holes large enough to permit use of tampers in the full depth of hole.
2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
   1. Make holes 6 inches in diameter larger than pole diameter.
   2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.
   3. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
   4. Cure concrete a minimum of 72 hours before performing work on pole.

G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

H. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Division 16 section “Grounding and Bonding." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

A. Ground poles and support structures according to Division 16 Section “Grounding and Bonding."
   1. Install wire type equipment grounding conductor in circuits supplying pole luminaires. Bond EGC to metallic components of pole accessories and foundations and any other exposed metal parts.
   2. Grounding electrodes at pole bases are not required unless multiple circuits supply pole structure, or if specifically indicated on design drawings.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture, base, and pole for damage. Replace damaged fixtures and components.

3.6 CLEANING

A. Clean electrical parts and remove foreign materials.

B. Remove dirt and debris from enclosure.

C. Clean finishes and touch up damage.

END OF SECTION 26 5600

NO CONTENT ON THIS PAGE

SECTION 26 56 19

LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:
1. Section 260926 "Lighting Control Panelboards" for panelboard-based lighting control.
2. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:

D. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports[and seismic restraints].

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

B. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 FIELD CONDITIONS

A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified.

2.2 LUMINAIRE 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. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61

F. IDA-IES Model Lighting Ordinance (MLO), Table C 2011 for
1. Backlight
2. Uplight
3. glare

G. Zero light emitted above 90 degreees from the vertical axis

H. CRI of minimum 70. CCT of 3000 K.

I. L70 lamp life of 50,000 hours.

J. Lamps dimmable from 100 percent to 0 percent of maximum light output.

K. Nominal Operating Voltage: 277 V ac.

L. Source Limitations: Obtain luminaires from single source from a single manufacturer.

M. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

C. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

E. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

F. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

2.4 FINISHES

A. Variations in Finishes: 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.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: As selected from manufacturer's standard catalog of colors.
    b. Color: As selected by Architect from manufacturer's full range.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections.

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

   a. IES LM-5.
   b. IES LM-50.
   c. IES LM-52.
   d. IES LM-64.
   e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires, and photocell relays.

END OF SECTION 265619

SECTION 27 05 00

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section includes general requirements for all Division 28 sections: submittals, inspections, permits, substitutions, and training. Reference Division 1 of specifications.

1.2 SUMMARY

A. Section Includes:

1. Communications equipment coordination and installation.
2. Sleeves for pathways and cables.
3. Sleeve seals.
4. Grout.
5. Common communications installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. All data for Division 27 must be submitted as a single package as the Engineer will commence review only when all data has been received. Submit shop drawings and product data grouped by Section as indicated in the “Communications Submittal Register” at the end of this section. Electronic submittals are acceptable in accordance with Paragraph B below. Engineer will commence review only when all data has been received in the format required. Incomplete submittals will be returned to sender.

B. Electronic submittals will be reviewed when allowed by the Prime Design Professional (Architect or Other Engineer.) Electronic submittals will be reviewed provided the following conditions are met.

1. Complete submittals in pdf format will be reviewed by CSI Specification Division
2. All data for Division 27 must be submitted as a single package as the Engineer will commence review only when all data has been received.
3. Submittals linked to a manufacturer’s web site will not be reviewed
4. Re-submittals must highlight changes from previous submittals.
5. Mixed submittals (part paper and part electronic) will not be reviewed

C. The Contractor shall determine and verify field measurements and field construction criteria for conformance with Drawings and Specifications and for conflicts with other items of Construction past or present. He shall coordinate each submittal with the requirements of the Work and of the Contract Documents and notify the Engineer in writing, at the time of the submission, of any and all deviations in the submittals from requirements of the Work and Contract Documents.

D. No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.

E. Engineer's review does not constitute acceptance or responsibility for accuracy or dimensions, nor shall it relieve the Contractor from meeting any requirements of the Work and Contract Documents, nor shall it constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the

submittal and specifically allowed by the Engineer by specific written notification for each such variation. The Engineer's review will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

F. Submit copies of materials for submittal review as required by Division 1.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping".

1.6 FINAL INSPECTIONS

A. Engineer will make periodic inspections as appropriate and deemed necessary by Engineer. One final inspection for completion of project will be performed by the Engineer. Any and all additional inspections requested by the Contractor or required because of contractor's failure to complete Scope of Work shall be paid for by the Contractor. The cost of additional inspection(s) shall be deducted from the contract amount stated in the agreement between the Owner and the Contractor. Costs for additional inspections shall be assessed at the Engineer’s hourly rates.

1.7 PERMITS

A. Permits necessary for the performance of the work under this contract shall be secured and paid for by the Contractor. Final inspection by the Engineer will not be made or certificate of final payment issued until certificates of satisfactory inspection from the inspection authorities are delivered.

1.8 SUBSTITUTIONS

A. Prior approval required. When required by Division 1 of the Specifications, materials and equipment in Division 27 will be reviewed for prior approval. Bidder is required to document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

B. Basis of Design. Equipment/materials indicated in schedules and details shown on the plans form the Basis of Design for this project. Alternate equipment/materials proposed by the contractor must match the specified in dimension, configuration, weight, electrical requirements, etc. Any revision to plans necessary to accommodate the alternate equipment will be the responsibility of the contractor and be reflected in a shop drawing prepared by the contractor and approved by the Engineer.

1.9 TRAINING

A. The electrical contractor shall conduct a 4 hour minimum training session with owner designated staff to review all communications equipment installed under this contract. At a minimum, the session will include operation and maintenance and basic operation of the systems. Contractor shall physically demonstrate the operation of each piece of equipment. A sign in sheet and agenda indicating a list of all equipment reviewed shall be included in the close out documents.

PART 2 - PRODUCTS

2.1 SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.

b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.

b. Calpico, Inc.

c. Metraflex Co.

d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.

3. Pressure Plates: Plastic. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

I. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants".

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and

sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.5 EXISTING SERVICES

A. The Contractor shall carefully examine the drawings and specifications, visit the site of the work, fully inform himself as to all existing conditions, dimensions and limitations before starting work.

B. If existing active or non-active services (which are not shown on plans) are encountered that require relocation or disconnection, the Contractor shall notify the Engineer for a decision on proper handling of these services. The Contractor shall not proceed with the work until so authorized.

END OF SECTION 27 0500

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SECTION 27 13 23

COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. 9/125 micrometer single-mode, indoor-outdoor optical fiber cable (OS1).
2. 9/125 micrometer single-mode, indoor-outdoor optical fiber cable (OS2).
3. Optical fiber cable connecting hardware, patch panels, and cross-connects.
4. Cabling identification products.

1.2 OPTICAL FIBER BACKBONE CABLING DESCRIPTION

A. Optical fiber backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics including the following:

a. Telecommunications rooms plans and elevations.
b. Telecommunications pathways.
c. Telecommunications system access points.
d. Telecommunications grounding system
e. Cross-connects.
f. Patch panels.
g. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.
5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
a. Vertical and horizontal offsets and transitions.
b. Clearances for access above and to side of cable trays.

c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

C. Optical fiber cable testing plan.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Testing Agency Qualifications: Engage a qualified testing agency to perform tests and inspections.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: **25** or less.
2. Smoke-Developed Index: **50** or less.

1.7 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: **25** or less.
2. Smoke-Developed Index: **50** or less.

C. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

D. Grounding: Comply with TIA-607-B.

2.2 9/125 MICROMETER, SINGLE-MODE, INDOOR-OUTDOOR OPTICAL FIBER CABLE (OS2)

A. Description: Single mode, 9/125-micrometer, fiber count by owner, stranded loose tube, **armored** optical fiber cable.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. 3M.
2. Belden CDT Inc.; Electronics Division.
3. Berk-Tek; a Nexans company.
4. CommScope, Inc.
5. Corning Cable Systems
6. Mohawk; a division of Belden CDT.
7. Superior Essex Inc.

C. Standards:

1. Comply with TIA-492CAAB for detailed specifications.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with ICEA S-104-696 for mechanical properties.

D. Armored cable shall be **aluminum** armored type.

E. Maximum Attenuation: **0.5** dB/km at 1310 nm; **0.5** dB/km at 1550 nm.

F. Jacket:

1. Jacket Color: **Yellow**.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

G. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262; Type OFNP in listed plenum communications raceway; or Type OFN, Type OFNG, Type OFNP, or Type OFNR in metallic conduit.
2. Riser Rated, Nonconductive: Type OFNP or Type OFNR in listed riser or plenum communications raceway.
3. Plenum Rated, Armored (Conductive): Type OFCP or Type OFNP in listed plenum communications raceway.
4. Riser Rated, Armored (Conductive): Type OFCP, Type OFNP, Type OFCR, or Type OFNR in metallic conduit.

2.3 OPTICAL FIBER CABLE HARDWARE

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. ADC.
   2. American Technology Systems.
   3. Belden CDT Inc.; Electronics Division.
   4. Berk-Tek; a Nexans company.
   5. Corning Cable Systems
   6. Optical Cable Corporation.
   7. Optical Connectivity Solutions.
   8. Siemon Co.

B. Standards:

   1. Comply with Optical Fiber Connector Intermateability Standard specifications of the TIA-604 series.
   2. Comply with TIA-568-C.3.

C. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

   1. Number of Connectors per Field: **One** for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

D. Patch Cords: Factory-made, dual-fiber cables in **36-inch** lengths.

E. Connector Type: **Type SC/UCP complying with TIA-604-3-B,** connectors.

F. Plugs and Plug Assemblies:

   1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
   2. Insertion loss not more than [**0.25**] [**0.75**] dB.
   3. Marked to indicate transmission performance.

G. Jacks and Jack Assemblies:

   1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
   2. Insertion loss not more than [**0.25**] [**0.75**] <**Insert number**> dB.
   3. Marked to indicate transmission performance.
   4. Designed to snap-in to a patch panel or faceplate.

2.4 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.

C. Factory test pre-terminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

A. Comply with NECA 1, NECA 301, and NECA/BICSI 568.

B. General Requirements for Optical Fiber Cabling Installation:

1. Comply with TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.

4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, provide a 10-foot-long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable **6 feet** long not less than **12 inches** in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

A. Install grounding according to BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: **Class 3**.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for **Class 3** level of administration.

C. Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling" for cable and asset management software.

D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, **backbone pathways and cables, entrance pathways and cables,** terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

F. Cable and Wire Identification:

1. Label each cable within **4 inches** of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding **15 feet**.
4. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
b. Link End-to-End Attenuation Tests:

1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 27 1323

SECTION 27 15 13

COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Category 5e twisted pair cable.
2. Category 6 twisted pair cable.
3. Category 6a twisted pair cable.
4. Twisted pair cable hardware, including plugs and jacks.
5. Cable management system.
6. Grounding provisions for twisted pair cable.

1.2 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration Drawings and printouts.
4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment.

B. Twisted pair cable testing plan.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **Installer,** installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of **Technician**, who shall be present at all times when Work of this Section is performed at Project site.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.7 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.8 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, provide software support for **two** years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within **two** years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Provide **30** days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway or Type CMP in listed cable routing assembly.
2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
3. Communications, Non-plenum: Type CMR complying with UL 1666.
4. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
5. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable,[**with internal spline,**] certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.

6. Mohawk; a division of Belden CDT.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Superior Essex Inc.
9. SYSTIMAX Solutions; a CommScope Inc. brand.
10. 3M.

C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Shielding/Screening: [**Unshielded twisted pairs (UTP)**] [**Shielded twisted pairs (FTP)**] [**Screened twisted pairs (F/UTP)**] [**Screened and shielded twisted pairs (F/FTP)**].

F. Cable Rating: Plenum.

G. Jacket: White thermoplastic.

H. .

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of **Category 6**.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.

D. Connecting Blocks:
1. 110-style IDC for Category 6.
2. Provide blocks for the number of cables terminated on the block, plus **25** percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.

3. Number of Jacks per Field: One for each four-pair **cable indicated.** Cords are generally available in lengths of up to 20 feet (6 m) and longer in 24-inch (600-mm) increments.

F. Patch Cords: Factory-made, four-pair cables in **36-inch 48-inch** lengths; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

G. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

H. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

I. Faceplate:

1. Two, four or six port, vertical single gang faceplates designed to mount to single gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

    a. Flush mounting jacks, positioning the cord at a 45-degree angle.

J. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 CABLE MANAGEMENT SYSTEM

A. Description: Computer-based cable management system, with integrated database capabilities.

B. Document physical characteristics by recording the network, TIA details, and connections between equipment and cable.

C. Information shall be presented in database view, schematic plans, or technical drawings.

D. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.6 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

PART 3 - EXECUTION

3.1 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters **and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used**. Conceal raceway and cables, except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

D. General Requirements for Cabling:

1. Comply with TIA-568-C.1.
2. Comply with BICSI's Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot-long service loop on each end of cable.

12. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.

3.2 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.3 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.4 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. Paint and label colors for equipment identification shall comply with TIA-606-B for **Class 2** level of administration.

C. Equipment grounding conductors.

D. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 27 1513

SECTION 28 15 00

ACCESS CONTROL HARDWARE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The work consists of providing and installing prescribed systems and equipment, in accordance with the Owner's directives and needs. The Contractor shall design, install, and configure systems to provide the exact function described herein and will be held to the operational criteria. Contractor shall be responsible for providing and installing a complete and fully operational system, with the intended features and capabilities, whether or not all required parts, components, systems or accessories are specified in the construction documents. Contractor shall provide all required parts, components, systems, materials and accessories needed for a complete and working system, without additional cost to the owner.

B. Furnish all labor, materials, tools, equipment, and services for all Access Control Equipment, as indicated, in accord with provisions of Contract Documents. Final terminations and system commissioning to be performed by a factory certified technician. Systems and the respective specification sections which are part of this section include:

C. Items include but are not limited to the following:
1. Reader Controller
2. Reader Interface
3. Access Control and Alarm Monitoring software (existing)
4. Power Supply
5. Card Reader and Credentials
6. On-line networked locks, wireless and hardwired
7. Off-line locks controlled by access control and alarm monitoring software
8. Wiring, switches, and ancillary equipment
9. Although such work is not specifically indicated, provide and install supplementary or miscellaneous items, appurtenances and devices incidental to, or necessary for, a sound, secure and complete installation.
10. Training on operation and software of the access control system per Section 3.7 of this specification section.

D. Intent of Access Control specification
1. The following specification shall be considered as coordinated with the general conditions, special conditions and the preamble of this and other related sections. It shall be the Security Contractor's responsibility to furnish all necessary systems and equipment, in accordance with the Owner's directives and needs.
2. Where items aren't definitely or correctly specified and are required for completion of the work, a written statement of such omission, error, or other discrepancy shall be sent to the Architect, prior to date specified for receipt of bids for clarification by addendum; or,

furnish such items in the type and quality established by this specification, and appropriate to the service intended.

E. Adjustments to the Contract Sum will not be allowed for omissions not clarified prior to bid opening.

1.3 ACTION SUBMITTALS

A. All data for Division 28 must be submitted as a single package as the Engineer will commence review only when all data has been received. Submit shop drawings and product data in a pdf file to include complete submittals of related system, products, and accessories. Engineer will commence review only when all data has been received in the format required. Incomplete submittals will be returned to sender.

B. The Contractor shall determine and verify field measurements and field construction criteria for conformance with Drawings and Specifications and for conflicts with other items of Construction past or present. He shall coordinate each submittal with the requirements of the Work and of the Contract Documents and notify the Engineer in writing, at the time of the submission, of any and all deviations in the submittals from requirements of the Work and Contract Documents. No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.

C. Engineer's review does not constitute acceptance or responsibility for accuracy or dimensions, nor shall it relieve the Contractor from meeting any requirements of the Work and Contract Documents, nor shall it constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer by specific written notification for each such variation. The Engineer's review will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

D. Submit copies of materials for submittal review as required by Division 1.

E. Product Data: For each type of product indicated.

F. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Diagrams for cable management system.
2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.

4. Cable Administration Drawings: As specified in "Identification" Article.
5. Battery and charger calculations for central station, workstations, and controllers.

G. Product Schedules.

H. Samples: For workstation outlets, jacks, jack assemblies, and faceplates. For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Credential card blanks, ready for printing. Include enough credential cards for all personnel to be enrolled at the site plus an extra **50** percent for future use.
2. Fuses of all kinds, power and electronic, equal to **10** percent of amount installed for each size used, but no fewer than three units.

1.7 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
1. Furnish security equipment to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.
2. Furnish security equipment to comply with the requirements of American National Standards for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People (ICC/ANSI A117.1), the governmental authority having jurisdiction and to comply with Americans with Disabilities Act.

B. System supplier must be certified by Acre/DNA Fusion and Open Options, the equipment manufacturer, for installing, supporting and servicing the products to be furnished. Certification shall be submitted on the equipment manufacturer's letterhead.

C. Contractor qualifications:
1. Company that is trained, authorized, and certified to install the specified products.
2. Company with a minimum of 5 (five) years system design, engineering supervision, and installation experience in the access control industry.
3. The contractor will maintain a fully staffed local office within 500 miles of the work site. The service center will be staffed by factory trained technicians and must be adequately equipped to provide emergency phone service within twenty-four (24) hours on a twenty-four (24) hour, 365 days per year basis, whether or not the owner purchases a maintenance contract with the contractor.
4. Within the local service center, the contractor must maintain an inventory of spare parts and other items critical to system operation and as necessary to meet the emergency service requirements.
5. The contractor must have in-house engineering and project management capability consistent with the requirements of this project. The contractor shall provide a project manager who is actively in the project. This person shall be the same individual throughout the course of the project and shall be the person responsible for the scheduling of the system programming, preparation of the Operation and Maintenance Manuals, Training Programs, documentation and system test-

ing, maintenance of Drawings and the coordination of all subcontract labor. The owner reserves the right to approve the contractor's Project Manager.

6. The contractor must abide by and adhere to all Drug Free School Zone laws and participate in a drug-free workplace program.
7. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

D. Testing Agency: Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Pre-Installation Conference: Prior to installation arrange conference between supplier, and related trades to review materials, procedures, and coordinating related work.

F. Sequencing: The work shall be performed in the following sequence, unless directed otherwise by owner's representative:
1. Installation of all wiring, conduit and rough-in boxes
2. Installation of Access Controllers, Modules & Power Supplies
3. Installation of new field devices and new readers/network locks
4. Installation of site control & front end equipment.
5. Commissioning of the new system components.
6. End User training

G. The Authorized Dealer will provide pricing for 1 year warranty from date of purchase.

H. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer

1.8 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components, except the central-station control unit, installed in temperature-controlled indoor environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
3. Indoor, Uncontrolled Environment: NEMA 250, **Type 3R** enclosures. System components installed in **non-temperature-controlled** indoor environments shall be rated for continuous operation in ambient conditions of 0 to 122 deg F bulb and 20 to 90 percent relative humidity, noncondensing.
4. Outdoor Environment: NEMA 250, NEMA 250, **Type 4** enclosures. System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 85 mph **and snow cover up to 24 inches thick**.

1.9 WARRANTY

A. All work and system components shall be covered by a one (1) year 'in field' warranty against defects in materials and workmanship, commencing with substantial completion of the project, unless otherwise directed by owner or their representative.

B. During system warranty period, system updates are to be made available to owner at no charge to owner.

C. During warranty period, provide twenty-four (24) hour toll-free technical support.

PART 2 - PRODUCTS

2.1 OPERATION

A. Security access system hardware shall use a single database for access-control and credential-creation functions.

2.2 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. Comply with NFPA 70, "National Electrical Code."

C. Comply with **SIA DC-01 and** SIA DC-03[**and SIA DC-07**].

2.3 DOOR CONTROLLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Mercury/Open Options

B. Door controllers:
1. Controllers shall be Mercury based
2. Compatibility: DNA Fusion access control software

2.4 CARD READERS, CREDENTIAL CARDS, AND KEYPADS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. HID
2. Approved Equal

B. Card Readers:

1. Card-Reader Power: Powered from its associated controller, including its standby power source, and shall not dissipate more than 5 W.

2. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.
3. Enclosure: Suitable for surface, semi-flush, pedestal, or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:

    a. Indoors, controlled environment.
    b. Indoors, uncontrolled environment.
    c. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.

4. Display: Digital visual indicator shall provide visible[**and audible**] status indications and user prompts. Indicate power on or off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.
5. Stripe Swipe Readers: Bidirectional, reading cards swiped in both directions, powered by the controller. Reader shall be set up for [**ABA Track**] <**Insert magnetic-stripe encoding**>.

    a. ABA Track: Magnetic stripe that is encoded on track 2, at 75-bpi density in binary-coded decimal format; for example, 5-bit, 16-character set.
    b. Readers for outdoors shall be in a polymeric plastic enclosure with all electronics potted in plastic. Rated for operation in ambient conditions of minus 40 to plus 160 deg F in a humidity range of 10 to 90 percent.

6. Wiegand Swipe Reader: Set up for [**33**] [**26**]-bit data cards. Comply with SIA AC-01.
7. Wiegand Key-Insert Reader: Set up for [**33**] [**26**]-bit data cards.
8. Bar-Code Reader: Set up for Code [**39**] [**93**] [**128**] <**Insert number**>.
9. Insert Readers: Requiring the card to be inserted from the [**bottom**] [**side**], powered by the controller.
10. Touch-Plate and Proximity Readers:

    a. Active-detection proximity card readers shall provide power to compatible credential cards through magnetic induction, and shall receive and decode a unique identification code number transmitted from the credential card.
    b. Passive-detection proximity card readers shall use a swept-frequency, RF field generator to read the resonant frequencies of tuned circuits laminated into compatible credential cards. The resonant frequencies read shall constitute a unique identification code number.
    c. The card reader shall read proximity cards in a range from direct contact to at least 6 inches from the reader.

C. Keypads:

1. Entry-control keypads shall use a unique combination of alphanumeric and other symbols as an Identifier.
2. Keypads shall contain an integral alphanumeric/special symbols keyboard with symbols arranged in ascending ASCII-code ordinal sequence.
3. Communication protocol shall be compatible with the local processor.
4. Keypad Display:

    a. Keypads shall include a digital visual indicator and shall provide [**visible**] [**visible and audible**] status indications and user prompts.

        1) Display shall indicate power on or off and whether user passage requests have been accepted or rejected.

b. Design of the keypad display or keypad enclosure shall limit viewing angles of the keypad as follows:

1) Maximum Horizontal Viewing Angle: Plus or minus 5 degrees or less off a vertical plane perpendicular to the plane of the face of the keypad display.
2) Maximum Vertical Viewing Angle: Plus or minus 15 degrees or less off a horizontal plane perpendicular to the plane of the face of the keypad display.

5. Keypad Response Time:

a. The keypad shall respond to passage requests by generating a signal to the local processor. The response time shall be 800 ms or less from the time the last alphanumeric symbol is entered until a response signal is generated.

6. Keypad Power:

a. The keypad shall be powered from the source as shown and shall not dissipate more than 150 W.

7. Keypad Mounting Method:

a. Keypads shall be suitable for surface, semi-flush, pedestal, or weatherproof mounting as required.

8. Keypad Duress Codes:

a. Keypads shall provide a means for users to indicate a duress situation by entering a special code.

D. Keypad and Wiegand-Swipe-Reader Combination: Designed to require an entry on the keypad before presenting the credential card.

1. Keypad: Allow the entry of four **numeric digits** that are associated with a specific credential. Keypads shall contain an integral alphanumeric/special symbol keyboard with symbols arranged in ascending ASCII-code ordinal sequence. Keypad display or enclosure shall limit viewing angles of the keypad as follows:

a. Maximum Horizontal Viewing Angle: Plus or minus 5 degrees or less off a vertical plane perpendicular to the plane of the face of the keypad display.
b. Maximum Vertical Viewing Angle: Plus or minus 15 degrees or less off a horizontal plane perpendicular to the plane of the face of the keypad display.

2. Wiegand Swipe Reader: Set up for [**33**] [**26**]-bit data cards to generate a unique card identification code. Comply with SIA AC-01.
3. The reader shall have "flash" download capability to accommodate card format changes. The card reader shall have capability of transmitting data to security control panel and shall comply with ISO/IEC 7816.
4. Communication Protocol: Compatible with local processor.

E. Credential Cards:

1. Modification: Entry-control cards shall be able to be modified by lamination direct print process during the enrollment process without reduction of readability. The design of the credential cards shall allow for the addition of at least one slot or hole to accommodate

the attachment of a clip for affixing the credential card to the badge holder used at the site.

2. Card Size and Dimensional Stability: Credential cards shall be 2-1/8 by 3-3/8 inches. The credential card material shall be dimensionally stable so that an undamaged card with deformations resulting from normal use shall be readable by the card reader.
3. Card Material: Abrasion resistant, nonflammable, nontoxic, and impervious to solar radiation and effects of ultraviolet light.
4. Card Construction:

    a. Core and laminate or monolithic construction.
    b. Lettering, logos, and other markings shall be hot stamped into the credential material or direct printed.
    c. Furnish equipment for on-site assembly and lamination of credential cards.

2.5 PUSH-BUTTON SWITCHES

A. Push-Button Switches: Momentary-contact back-lighted push buttons with stainless-steel switch enclosures.

B. Electrical Ratings:

1. Minimum continuous current rating of **10** A at 120-V ac or **5** A at 240-V ac.
2. Contacts that will make 720 VA at **60** A and that will break at 720 VA at **10** A.

C. Enclosures: Flush or surface mounting. Push buttons shall be suitable for flush mounting in the switch enclosures.

D. Enclosures shall additionally be suitable for installation in the following locations:

1. Indoors, controlled environment.
2. Indoors, uncontrolled environment.
3. Outdoors.

E. Power: Push-button switches shall be powered from their associated controller, using dc control.

2.6 CABLES

A. General Cable Requirements: Comply with requirements in Sections 271313 through 271523 and as recommended by system manufacturer for integration requirement.

B. PVC-Jacketed, TIA 232-F.

1. [**Three**] [**Nine**], No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. PVC jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

C. Plenum-Rated TIA 232-F Cables:

1. [**Three**] [**Nine**], No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PE insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

D. PVC-Jacketed, TIA 485-A Cables:

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. NFPA 70 Type: Type CM[**or Type CMG**].
6. Flame Resistance: Comply with UL 1581.

E. Plenum-Rated TIA 485-A Cables:

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. NFPA 70 Type: Type CMP
6. Flame Resistance: NFPA 262, Flame Test.

F. Multiconductor, PVC, Reader and Wiegand Keypad Cables:

1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.
4. For TIA 232-F applications.

G. Paired, PVC, Reader and Wiegand Keypad Cables:

1. Three pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

H. Paired, PVC, Reader and Wiegand Keypad Cables:

1. Three pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

I. Paired, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Three pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum-foil/polypropylene-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

J. Multiconductor, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Six conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

K. LAN Cabling:

1. Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."

2.7 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA 606-B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Product Schedules: Obtain detailed product schedules from manufacturer of access-control system or develop product schedules to suit Project. Fill in all data available from Project plans and specifications and publish as Product Schedules for review and approval.

D. In meetings with Architect and Owner, present Product Schedules and review, adjust, and prepare final setup documents. Use approved, final Product Schedules to set up system software.

3.2 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install cables and wiring according to requirements in Section 270513 "Conductors and Cables for Communications Systems."

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Support cable per NFPA 70. Conceal raceway and cables except in unfinished spaces.

D. Install LAN cables using techniques, practices, and methods that are consistent with Category 5e rating of components and optical fiber rating of components, and that ensure Category 6 and optical fiber performance of completed and linked signal paths, end to end.

E. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

F. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.3 CABLE APPLICATION

A. Comply with TIA 569-D, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 ft. between terminations.

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. between terminations.

E. Card Readers and Keypads:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft., and install No. 20 AWG wire if maximum distance is 500 ft..
3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed 250 ft. [**500 ft.**] <**Insert distance**> between terminations.

G. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of **25 ft.** between terminations.

3.4 GROUNDING

A. Comply with Section 270526 "Grounding and Bonding for Communications Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.5 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 270553 "Identification for Communications Systems" and with TIA 606-B.

3.6 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license to Owner.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use tester approved for type and kind of installed cable. Test for faulty connectors, splices, and terminations. Test according to TIA 568-C.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for balanced twisted-pair cables must comply with minimum criteria in TIA 568-C.1.
2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

END OF SECTION 28 1500

SECTION 28 20 00

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes a video surveillance system consisting of cameras, digital video recorder, data transmission wiring, and a control station with its associated equipment.

B. Related Requirements:

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

1.2 ACTION SUBMITTALS

A. All data for Division 28 must be submitted as a single package as the Engineer will commence review only when all data has been received. Submit shop drawings and product data grouped to include complete submittals of related system, products, and accessories. Engineer will commence review only when all data has been received in the format required. Incomplete submittals will be returned to sender.

B. The Contractor shall determine and verify field measurements and field construction criteria for conformance with Drawings and Specifications and for conflicts with other items of Construction past or present. He shall coordinate each submittal with the requirements of the Work and of the Contract Documents and notify the Engineer in writing, at the time of the submission, of any and all deviations in the submittals from requirements of the Work and Contract Documents. No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.

C. Engineer's review does not constitute acceptance or responsibility for accuracy or dimensions, nor shall it relieve the Contractor from meeting any requirements of the Work and Contract Documents, nor shall it constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer by specific written notification for each such variation. The Engineer's review will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

D. Submit copies of materials for submittal review as required by Division 1

E. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

F. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.
5. Wiring Diagrams: For power, signal, and control wiring and grounding.

G. Design Data: Include equipment list consisting of every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data. For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data" include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

B. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access control system shall comply with SIA TVAC.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in **temperature-controlled** interior environments shall be rated for continuous

operation in ambient temperatures of **36 to 122 deg F** dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.

3. Interior, Uncontrolled Environment: System components installed in non- **temperature-controlled** interior environments shall be rated for continuous operation in ambient temperatures of **0 to 122 deg F** dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, **Type 3R** enclosures.
4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of **minus 30 to plus 122 deg F** dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph **and snow cover up to 24 inches thick**. Use NEMA 250, **Type 4** enclosures.
5. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 75 ohms.

B. Surge Protection: Protect components from voltage surges entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.

C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 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. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

2.3 STANDARD CAMERAS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Milestone Care + and Milestone Corporate device license per camera
2. Axis Communications, Inc.
3. Avigilon

B. Color Camera:
1. Pickup Device: ½" Progressive **CMOS 1920(H) by 1080(V)** pixels, minimum.
2. Horizontal Resolution: 1920 lines minimum.
3. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
4. With AGC, manually selectable on or off.
5. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
6. Manually selectable modes for backlight compensation or normal lighting.
7. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
8. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
9. Motion Detector: Built-in digital.
10. Sensor count dependent on coverage requirements.

C. Automatic Color Dome Camera: Assembled and tested as a manufactured unit, containing dome assembly, color camera, motorized pan and tilt, zoom lens, and receiver/driver.
1. Pickup Device: ½" Progressive **CMOS 1920(H) by 1080(V)** pixels, minimum.
2. Horizontal Resolution: 1920 lines.
3. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
4. With AGC, manually selectable on or off.
5. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
6. Manually selectable modes for backlight compensation or normal lighting.
7. Pan and Tilt: Direct-drive motor, 360-degree rotation angle, and 180-degree tilt angle. Pan-and-tilt speed shall be controlled by operator. Movement from preset positions shall be not less than 300 degrees per second.
8. Preset Positioning: Eight user-definable scenes, each allowing 16-character titles. Controls shall include the following:

    a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
    b. Motion detection shall be available at each camera position.
    c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.

9. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.

10. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
11. Motion Detector: Built-in digital.
12. Dome shall support multiplexed control communications using coaxial cable recommended by manufacturer.
13. Sensor count dependent on coverage requirements.

2.4 LENSES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Axis Communications, Inc.
   2. Avigilon

B. Description: Optical-quality coated lens, designed specifically for video-surveillance applications and matched to specified camera. Provide color-corrected lenses.

   1. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.
   2. Fixed Lens: With calibrated focus ring.
   3. Zoom Lens: Motorized, remote-controlled unit, rated as "quiet operating." Features include the following:

      a. Electrical Leads: Filtered to minimize video signal interference.
      b. Motor Speed: Variable.
      c. Lens shall be available with preset positioning capability to recall the position of specific scenes.

2.5 POWER SUPPLIES

A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera and lens.

   1. Enclosure: NEMA 250, Type 1 or Type 3.

2.6 CAMERA-SUPPORTING EQUIPMENT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Axis Communications, Inc.
   2. Avigilon

B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.

C. Pan-and-Tilt Units: Motorized units arranged to provide remote-controlled aiming of cameras with smooth and silent operation, and equipped with matching mounting brackets.

   1. Panning Rotation: 0 to 355 degrees, with adjustable stops.
   2. Tilt Movement: 90 degrees, plus or minus 5 degrees, with adjustable stops.
   3. Speed: 12 degrees per second in both horizontal and vertical planes.
   4. Wiring: Factory prewired for camera and zoom lens functions and pan-and-tilt power and control.

5. Pan-and-tilt unit shall be available with preset positioning capability to recall the position of a specific scene.

D. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.

E. Protective Housings for Fixed and Movable Cameras: Steel **or 6061 T6 aluminum** enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.

1. Tamper switch on access cover sounds an alarm signal when unit is opened or partially disassembled. Central-control unit shall identify tamper alarms and indicate location in alarm display. Tamper switches and central-control unit are specified in Section 283100 "Intrusion Detection."
2. Camera Viewing Window: **Polycarbonate** or **Lexan** window, aligned with camera lens.
3. Duplex Receptacle: Internally mounted.
4. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.
5. Built-in, thermostat-activated [**heater**] [**and**] [**blower**] units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
6. Sun shield shall not interfere with normal airflow around the housing.
7. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.
8. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.
9. Enclosure Rating: NEMA 1 or NEMA 4X, IP66

2.7 COLOR MONITORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bosch Security System
2. GE Security
3. Samsung
4. SANYO
5. Approved Equal

B. Screen Size (Diagonal Dimension): 32”

C. Horizontal Resolution: 1280 minimum lines.

D. Minimum Front Panel Devices and Controls: Power switch; power-on indicator; and brightness, contrast, color, and tint controls.

E. Degaussing: Automatic.

F. Mounting: **Single, 14-inch**, vertical, EIA 19-inch electronic equipment rack or cabinet complying with CEA 310-E.

G. Electrical: 120-V ac, 60 Hz.

2.8 NETWORK VIDEO RECORDERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Milestone Care + and Milestone Corporate device license per camera
2. Axis Communications, Inc.
3. Avigilon

B. Milestone software

C. Windows based operating system.

D. External storage or internal 250-1, 500-GB hard disk drive.

1. Video and audio recording over TCP/IP network.
2. Video recording of MPEG-2, MPEG-4, or H.264 streams.
3. Video recording up to 48 Mbps for internal storage and up to 100 Mbps for external storage.
4. Duplex Operation: Simultaneous recording and playback.
5. Continuous and alarm-based recording.
6. Full-Featured Search Capabilities: Search based on camera, time, or date.
7. Automatic data replenishment to ensure recording even if network is down.
8. Digital certification by watermarking.
9. Internal RAID storage or non-RAID storage of up to **4 TB**.
10. Capable of adding external RAID storage up to **16 TB** for models with no internal storage.
11. Full integration with LAN, Intranet, or Internet through standard Web browser or video management software.
12. Integrated Web server FTP server functionality.
13. Supports up to 16[**, 32,**] or [**64**] <**Insert number**> devices.

E. PTZ Controls: Arranged for multiple-camera control, with switches to select camera to be controlled.

1. Pan-and-Tilt Control: Joystick type.
2. Zoom Control: Momentary-contact, "in-out" push button.
3. Automatic-Scan Control: A push button for each camera with pan capability that places camera in automatic-scanning mode.

2.9 IP VIDEO SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Axis Communications, Inc.
2. Avigilon

B. Description:

1. System shall utilize Milestone software

2. System shall be Windows-based

3. System shall provide high-quality delivery and processing of IP-based video, audio, and control data using standard Ethernet-based networks.
4. System shall have seamless integration of all video surveillance and control functions.

5. Graphical user interface software shall manage all IP-based video matrix switching and camera control functions, two-way audio communication, alarm monitoring and control, and recording and archive/retrieval management. IP system shall also be capable of integrating into larger system environments.
6. System design shall include all necessary compression software for high-performance, dual-stream, MPEG-2/MPEG-4 video. Unit shall provide connections for all video cameras, camera PTZ control data, bidirectional audio, discreet sensor inputs, and control system outputs.
7. All camera signals shall be compressed, encoded, and delivered onto the network for processing and control by the IP video-management software.
8. Camera system units shall be ruggedly built and designed for extreme adverse environments, complying with NEMA Type environmental standards.
9. Encoder/decoder combinations shall place video, audio, and data network stream that can be managed from multiple workstations on the user's LAN or WAN.
10. All system interconnect cables, workstation PCs, PTZ joysticks, and network intermediate devices shall be provided for full performance of specified system.

2.10 SIGNAL TRANSMISSION COMPONENTS

A. Cable: Coaxial cable elements have 75-ohm nominal impedance. Comply with requirements in Section 270513 "Conductors and Cables for Communications Systems."

B. Video Surveillance Coaxial Cable Connectors: BNC type, 75 ohms. Comply with requirements in Section 270513 "Conductors and Cables for Communications Systems."

PART 3 - EXECUTION

3.1 WIRING

A. Wiring Method: Install cables in raceways unless otherwise indicated.

1. Except raceways are not required in accessible indoor ceiling spaces.
2. Conceal raceways and wiring except in unfinished spaces.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

C. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. For communication wiring, comply with the following:

1. Section 271313 "Communications Copper Backbone Cabling."
2. Section 271323 "Communications Optical Fiber Backbone Cabling."
3. Section 271513 "Communications Copper Horizontal Cabling."
4. Section 271523 "Communications Optical Fiber Horizontal Cabling."
5. Section 271533 "Communications Coaxial Horizontal Cabling."

E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.2 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras with 84-inch-minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

B. Set pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

C. Avoid ground loops by making ground connections only at the control station.

1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

D. Identify system components, wiring, cabling, and terminals according to Section 270553 "Identification for Communications Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

    a. Verify operation of auto-iris lenses.
    b. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    c. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    d. Set and name all preset positions; consult Owner's personnel.
    e. Set sensitivity of motion detection.
    f. Connect and verify responses to alarms.
    g. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation.

C. Video surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION 28 2000

SECTION 28 46 21.11

ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
2. See Sections 271313 through 271523 for cables and conductors for fire-alarm systems.

B. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
6. Carbon monoxide detectors.
7. Notification appliances.
8. Magnetic door holders.
9. Remote annunciator.
10. Addressable interface device.
11. Digital alarm communicator transmitter.
12. Firefighters' two-way telephone communication service.
13. Radio alarm transmitter.
14. System printer.

1.2 ACTION SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Engineer.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified, fire-alarm technician; Level III minimum.
c. Licensed or certified by authorities having jurisdiction.

B. Product Data: For each type of product, including furnished options and accessories.

C. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor

sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring required for HVAC unit shutdown on alarm.
    c. Locate detectors according to manufacturer's written recommendations.
12. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.

13. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Data: Certificates, for fire-alarm control unit, accessories, and components, from manufacturer.

C. Field quality-control reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01 "Operation and Maintenance Data," include the following:

a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment.
d. Riser diagram.
e. Record copy of site-specific software.
f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

g. Manufacturer's required maintenance related to system warranty requirements.
h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.
i. Copy of NPFA 25

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Installer Qualifications: Installation shall be supervised by personnel certified by NICET as fire-alarm Level III technician.

E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

G. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FM Global-approved alarm company.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
1. Notify Construction Manager and Owner no fewer than five days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Construction Manager's and Owner's written permission.

1.8 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
2. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
3. Keys and Tools: One extra set for access to locked and tamperproofed components.
4. Audible and Visual Notification Appliances: One of each type installed.

5. Fuses: Two of each type installed in the system.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices **and systems**:

1. Manual stations.
2. Heat detectors.
3. Flame detectors.
4. Smoke detectors.
5. Duct smoke detectors.
6. Carbon monoxide detectors.
7. Automatic sprinkler system water flow.
8. Fire-extinguishing system operation.
9. Fire standpipe system.
10. Dry system pressure flow switch.
11. Heat detectors in elevator shaft and pit.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.

2. Activate voice/alarm communication system.
3. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Unlock electric door locks in designated egress paths.
6. Release fire and smoke doors held open by magnetic door holders.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
9. Activate preaction system.
10. Recall elevators to primary or alternate recall floors.
11. Activate elevator power shunt trip.
12. Activate emergency lighting control.

13. Activate emergency shutoffs for gas and fuel supplies.
14. Record events in the system memory.
15. Record events in system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
3. Elevator shunt-trip supervision.
4. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Fire-pump power failure, including a dead-phase or phase-reversal condition.
11. Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Potter Electric Signal Company
2. Firelite
3. Silent Knight

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and

supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, **Class B**.
2. Pathway Survivability: **Level 1**.

E. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

F. Elevator Recall:

1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:

    a. Elevator lobby detectors except the lobby detector on the designated floor.
    b. Smoke detector in elevator machine room.
    c. Smoke detectors in elevator hoistway.

2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

    a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

G. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory.

I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

J. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided as a special module that is part of fire-alarm control unit

K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals, supervisory and digital alarm communicator transmitters, and digital alarm radio transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

L. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

2.4 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Potter Electrical Signal Company
2. Listed compatible manufacturer

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm

2.5 SYSTEM SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Potter Electrical Signal Company
2. Listed compatible manufacturer

B. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be **two**-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
c. Multiple levels of detection sensitivity for each sensor.

C. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

D. Ionization Smoke Detector:
a. Ionization smoke detectors shall not be used.

E. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.6 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Comply with UL 2075.

6. Locate, mount, and wire according to manufacturer's written instructions.
7. Provide means for addressable connection to fire-alarm system.
8. Test button simulates an alarm condition.

2.7 NONSYSTEM SMOKE DETECTORS.

A. General Requirements for Nonsystem Smoke Detectors:

1. Nonsystem smoke detectors shall be listed as compatible with the fire-alarm equipment installed or shall have a contact closure interface listed for the connected load.
2. Nonsystem smoke detectors shall meet the monitoring for integrity requirements in NFPA 72.

B. Single-Station Smoke Detectors:

1. Comply with UL 217; suitable for NFPA 101, residential occupancies; operating at 120-V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
2. Auxiliary Relays: One Form C, rated at 0.5 A.
3. Audible Notification Appliance: Piezoelectric sounder rated at 90 dBA at 10 feet according to UL 464.
4. Visible Notification Appliance: 177-cd strobe.
5. Heat sensor, 135 deg F fixed temperature.
6. Test Switch: Push to test; simulates smoke at rated obscuration.
7. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
8. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
9. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
10. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

C. Single-Station Duct Smoke Detectors:

1. Comply with UL 268A; operating at 120-V ac.
2. Sensor: LED or infrared light source with matching silicon-cell receiver.

    a. Detector Sensitivity: Smoke obscuration between 2.5 and 3.5 percent/foot when tested according to UL 268A.

3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. The fixed base shall be designed for mounting directly to air duct. Provide terminals in the fixed base for connection to building wiring.

    a. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; listed for use with the supplied detector.

4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.8 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Potter Electrical Signal Company
   2. Listed compatible manufacturer

B. General Requirements for Heat Detectors: Comply with UL 521.

   1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature or a rate of rise.

   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature.

   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.9 NOTIFICATION APPLIANCES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Potter Electrical Signal Company
   2. Listed compatible manufacturer

B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

   1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

C. Chimes: Vibrating type.

D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464.

E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.

   1. Rated Light Output: 15/30/75/110 cd, selectable in the field.

   2. Mounting: Wall mounted unless otherwise indicated.
   3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
   4. Flashing shall be in a temporal pattern, synchronized with other units.
   5. Strobe Leads: Factory connected to screw terminals.
   6. Mounting Faceplate: Factory finished, red.

F. Voice/Tone Notification Appliances:

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.
4. Mounting: Flush.
5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.10 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnets: Require no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.11 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.12 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall, to circuit-breaker shunt trip for power shutdown, or as required by other system.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.
6. <**Insert local function**>.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.
9. <**Insert signal to be transmitted**>.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.14 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE

A. Dedicated, two-way, supervised, telephone voice communication links between fire-alarm control unit and remote firefighters' telephone stations. Supervised telephone lines shall be connected to talk circuits by controls in a control module. Provide the following:
1. Common-talk type for firefighter use only.
2. Selective-talk type for use by firefighters and fire wardens.

3. Controls to disconnect phones from talk circuits if too many phones are in use simultaneously.
4. Audible Pulse and Tone Generator, and High-Intensity Lamp: When a remote telephone is activated, it causes audible signal to sound and high-intensity lamp to flash.
5. Selector panel controls shall provide for simultaneous operation of up to six telephones in selected zones. Indicate ground faults and open or shorted telephone lines on the panel front by individual LEDs.
6. Display: Liquid-crystal digital to indicate location of caller
7. Remote Telephone Cabinet: Flush- or surface-mounted cabinet as indicated, factory-standard red finish, with handset.
   a. Install one-piece handset to cabinet with vandal-resistant armored cord. Silk-screened or engraved label on cabinet door, designating "Fire Emergency Phone."
   b. With "break-glass" type door access lock.
8. Remote Telephone Jack Stations: Single-gang, stainless-steel-plate mounted plug, engraved "Fire Emergency Phone."
9. Handsets: 2 push-to-talk-type sets with noise-canceling microphone stored in a cabinet adjacent to fire-alarm control unit.

2.15 RADIO ALARM TRANSMITTER

A. Transmitter shall comply with NFPA 1221 and shall be listed and labeled by an NRTL.

B. Comply with 47 CFR 90.

C. Description: Manufacturer's standard commercial product; factory assembled, wired, tested, and ready for installation and operation.
   1. Packaging: A single, modular, NEMA 250, Type 1 metal enclosure with a tamper-resistant flush tumbler lock.
   2. Signal Transmission Mode and Frequency: VHF or UHF 2-W power output, coordinated with operating characteristics of the established remote alarm receiving station designated by Owner.
   3. Normal Power Input: 120-V ac.
   4. Secondary Power: Integral-sealed, rechargeable, 12-V battery and charger. Comply with NFPA 72 requirements for battery capacity; submit calculations.
   5. Antenna: Omnidirectional, coaxial half-wave, dipole type with driving point impedance matched to transmitter and antenna cable output impedance. Wind-load strength of antenna and mounting hardware and supports shall withstand 100 mph with a gust factor of 1.3 without failure.
   6. Antenna Cable: Coaxial cable with impedance matched to the transmitter output impedance.
   7. Antenna-Cable Connectors: Weatherproof.
   8. Alarm Interface Devices: Circuit boards, modules, and other auxiliary devices, integral to the transmitter, matching fire-alarm and other system outputs to message-generating inputs of the transmitter that produce required message transmissions.

D. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit or from its own internal sensors or controls and shall automatically transmit signal along with a unique code that identifies the transmitting station to the remote alarm receiving station. Transmitted messages shall correspond to standard designations for fire-reporting system to which the signal is being transmitted and shall include separately designated messages in response to the following events or conditions:
   1. Transmitter Low-Battery Condition: Sent when battery voltage is below 85 percent of rated value.

2. System Test Message: Initiated manually by a test switch within the transmitter cabinet, or automatically at an optionally preselected time, once every 24 hours, with transmission time controlled by a programmed timing device integral to transmitter controls.
3. Transmitter Trouble Message: Actuated by failure, in excess of one-minute duration, of the transmitter normal power source, derangement of the wiring of the transmitter, or any alarm input interface circuit or device connected to it.
4. Local Fire-Alarm-System Trouble Message: Initiated by events or conditions that cause a trouble signal to be indicated on the building system.
5. Local Fire-Alarm-System Alarm Message: Actuated when the building system goes into an alarm state. Identifies device that initiated the alarm.
6. Local Fire-Alarm-System Supervisory-Alarm Message: Actuated when the building alarm system indicates a supervisory alarm.

2.16 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
   1. Factory fabricated and furnished by manufacturer of device.
   2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

C. Equipment Mounting: Install fire-alarm control unit on finished floor.

   1. Comply with requirements for seismic-restraint devices specified in Section 270548.16 "Seismic Controls for Communications Systems."

D. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

   1. Comply with requirements for seismic-restraint devices specified in Section 270548.16 "Seismic Controls for Communications Systems."

E. Manual Fire-Alarm Boxes:

   1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
   2. Mount manual fire-alarm box on a background of a contrasting color.
   3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

F. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.

G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

H. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

I. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

J. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

K. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

L. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

M. Device Location-Indicating Lights: Locate in public space near the device they monitor.

N. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that will resist 100-mph wind load with a gust factor of 1.3 without damage.

3.2 PATHWAYS

A. Pathways in all occupied areas shall be run recessed in wall in EMT.

B. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.

C. Pathways shall be installed in EMT.

D. Exposed EMT shall be painted red enamel.

3.3 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated HVAC duct systems.
2. Magnetically held-open doors.
3. Electronically locked doors and access gates.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Alarm-initiating connection to smoke control system (smoke management) at firefighter smoke control system panel.
8. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
9. Supervisory connections at valve supervisory switches.
10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
11. Supervisory connections at elevator shunt-trip breaker.
12. Supervisory connections at fire-pump power failure including a dead phase or phase-reversal condition.
13. Supervisory condition at fire-pump engine control panel.
14. Supervisory condition at distributed antenna system.
15. <**Insert connections**>.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for **two** years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within **two** years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least **30** days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 28 4621

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and grubbing.

B. Selective removal and trimming.

C. Earth stripping and stockpiling.

D. Repair and restoration.

E. Debris removal.

1.02 RELATED REQUIREMENTS

A. Section 02 41 00 - Demolition: Removal of built elements and utilities.

B. Section 31 23 23 - Fill: Material for filling holes, pits, and excavations generated as result of removal operations.

C. Section 32 93 00 - Plants: Relocation of existing trees, shrubs, and other plants; pruning.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.266 - Logging Operations; Current Edition.

B. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

C. ANSI A300 Part 5 - American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction); 2019.

D. ANSI A300 Part 6 - Tree, Shrub, and Other Woody Plant Management--Standard Practices (Planting and Transplanting); 2012 (Reapproved 2018).

E. ANSI Z133 - American National Standard for Arboricultural Operations - Safety Requirements; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene prework meeting one week prior to start of work of this section; require attendance by affected personnel.

B. Sequencing: Ensure utility disconnections are in orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Site Plan:
   1. Indicate vegetation removal limits.
   2. Indicate areas for temporary construction and field offices.

C. Clearing Firm Qualification Statement: Documentation of specialized experience.

1.06 QUALITY ASSURANCE

A. Clearing Firm Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 FIELD CONDITIONS

A. Ambient Conditions: Terminate work during hazardous environmental conditions according to 29 CFR 1910.266.

B. Existing Conditions: See site and utility survey, existing conditions survey, and site drawing.

PART 3 EXECUTION

2.01 EXAMINATION

A. Comply with additional requirements specified in Section 01 70 00 - Execution and Closeout Requirements.

B. Identify potential runoff areas.

C. Construction Fencing: See Section 01 50 00 - Temporary Facilities and Controls.

2.02 PREPARATION

A. Coordinate work with utility companies; notify before starting work and comply with local requirements; obtain required permits.

B. Contractor shall coordinate with Southern Ute Utilities Division and comply with Southern Ute Indian Tribe tribal permits and TERO (Tribal Employment Rights Office) regulations

C. Protect existing utilities to remain from damage.

D. Do not disrupt public utilities without permit from authority having jurisdiction.

E. Protect existing structures and other elements that are to remain.

F. Protect existing vegetation to remain from damage and monitor.

G. Develop dust remediation controls and methods. Do not use water if that results in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

H. Remove preexisting debris, junk, and trash on-site.

2.03 CLEARING AND GRUBBING

A. Clearing: Cut trees, stumps, shrubs, downed timber, and other vegetation for removal within identified area as indicated on drawings according to 29 CFR 1910.266. Follow recommendations of ANSI Z133 and best local practices for species involved.

B. Clear site after relocating vegetation in accordance with ANSI A300 Part 6.

C. Do not remove or damage vegetation 5' beyond the limits of construction, or as determined by the Owner or Owner’s Representative in the field

D. Install substantial, highly visible fences at least 5 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.
   2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
   3. Around other vegetation to remain within vegetation removal limits.
   4. See Section 01 50 00 for fence construction requirements.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum subsoil disturbance.

F. Grubbing: Remove stumps, roots, buried timber, and other vegetation minimum depth 12 inches (30 cm) from ground. Remove rocks minimum depth 6 inches (15 cm) from ground.

2.04 SELECTIVE REMOVAL AND TRIMMING

A. Selective Removal: Individual tree and shrub identified for removal as indicated on drawings according to 29 CFR 1910.266.
   1. Includes trees, stumps, shrubs, downed timber, and other vegetation identified for removal as indicated on drawings.
   2. Fell trees away from vegetation identified to remain.
   3. Pull stumps, remove roots, buried timber, and other vegetation identified for removal 12 inches (30 cm), minimum depth, from ground. Remove rocks 6 inches (15 cm), minimum depth, from ground.

4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and matching existing grade.

B. Selective Trimming: Individual limbs and branches cut back according to ANSI A300 Part 1 identified for removal as indicated on drawings. Follow recommendations of ANSI Z133 and best local practices for species involved.

2.05 EARTH STRIPPING AND STOCKPILING

A. Stripping:
   1. Remove topsoil within identified area:
   2. Remove topsoil within identified area as indicated on drawings.

B. Stockpiling:
   1. Place topsoil in identified areas as indicated on drawings:
      a. Pile depth not to exceed 8 feet.

2.06 REMOVED VEGETATION PROCESSING

A. Do not burn, bury, landfill, or leave on-site, except as indicated on drawings.

B. Trees: Sell if marketable.

C. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; give preference to on-site uses.

2.07 REPAIR AND RESTORATION

A. Remaining Existing Facilities, Utilities, and Site Features: If damaged due to this work, repair or replace to original condition.

B. Vegetation: Replace damaged or destroyed vegetation identified to remain as indicated on drawings at no cost to Owner:
   1. Outside removal limits.

2.08 DEBRIS REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and windblown debris from public and private lands.

2.09 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.

C. Leave site clean and ready to receive work.

END OF SECTION

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal and storage of topsoil.

B. Rough grading.

C. Fine grading.

D. Replacement and/or provision of topsoil and finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation.

C. Section 31 23 16.26 - Rock Removal.

D. Section 31 23 23 - Fill.

1.03 PRICE AND PAYMENT PROCEDURES

1.04 REFERENCE STANDARDS

A. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

B. Topsoil: Applies to Unit Price.
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing topsoil, supplying topsoil, stockpiling and placing where required, compacting, and dewatering.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with Southern Ute Utilities Division standards and the IHS Standard Specifications.

1.07 FIELD CONDITIONS

A. Existing Conditions: See site and utility survey and site drawing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel: Excavated on-site.
   1. Graded according to ASTM D2487 Group Symbol GW, GP, or SP.

B. Topsoil: Shall be a friable loam excavated from site or provided as necessary.
   1. Graded.
   2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.

C. Other Fill Materials: See Section 31 23 23.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify survey benchmark and intended elevations for grading areas are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect above- and below-grade utilities to remain.

D. Notify Project Engineer, Owner's Representative, the Southern Ute Utilities Division, and the utility company of any conflicts to remove and relocate utilities.

E. Contractor shall coordinate with Southern Ute Utilities Division and comply with Southern Ute Indian Tribe tribal permits and TERO (Tribal Employment Rights Office) regulations.

F. Provide temporary means and methods to remove standing or ponding water from areas prior to grading.

G. Protect site features to remain, including but not limited to bench marks, survey control points, and existing structures, from damage by grading equipment and vehicular traffic.

H. Remove topsoil in accordance with Section 31 10 00.

I. Excavate materials in accordance with Section 31 23 16.

J. Remove rock in accordance with Section 31 23 16.26.

K. Fill and backfill in accordance with Section 31 23 23.

L. Protect trees and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

A. Excavate and fill subgrade material to elevations indicated on plans.

B. Remove topsoil from entire site, without mixing with foreign materials.

C. Remove subsoil from areas to be further excavated.

D. Do not remove wet subsoil unless it is subsequently processed to obtain optimum moisture content, if to be incorporated in site fills.

E. Benching Slopes: Horizontally bench existing to key fill material to slope for firm bearing.

F. Replace displaced subgrade in accordance with Section 31 23 23.

G. Remove and replace unsuitable materials per Section 31 23 23 - Fill.

3.04 FINE GRADING

A. Scrape and spread subgrade material uniformly smooth and without disruptions as indicated on drawings.

B. Slopes: Transition smoothly to adjacent areas.

C. See Section 31 23 23 for final compaction.

3.05 SOIL REMOVAL AND STOCKPILING

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas designated on site; protect from erosion.

3.06 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth as indicated in the landscape plan.

D. In areas where vehicles or equipment have compacted soil, scarify surface to a depth of 3 inches.

E. Place topsoil in areas indicated on the landscape plan.

F. Place topsoil where required to level finish grade.

G. Place topsoil during dry weather.

H. Remove roots, weeds, rocks, and foreign material while spreading.

I. Near buildings and trees, spread topsoil manually to prevent damage.

J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

K. Lightly compact placed topsoil.

L. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.07 TOLERANCES

A. Top Surface of Finish Grade: Plus or minus 0.05 foot (5/8 inch).

3.08 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Leave site clean and raked, ready to receive work.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for footings, slabs-on-grade, site structures, and utilities within the building.

B. Temporary excavation support and protection systems.

1.02 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.

B. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; topsoil removal.

C. Section 31 22 00 - Grading: Grading.

D. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

E. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

F. Section 31 23 23 - Fill: Fill materials, backfilling, and compacting.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for excavation.

B. Unit Price: Excavating Soil Materials.
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating to required elevations, loading and placing materials in stockpile, and dewatering.
   3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

C. See Section 31 23 23 for measurement and payment provisions related to fill.

D. See Section 31 23 16.26 for measurement and payment provisions related to rock removal.

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record drawings at project closeout according to 01 70 00 - Execution and Closeout Requirements. Show locations of installed support materials left in place, including referenced locations and depths, on drawings.

C. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding and Fill to Correct Over-Excavation:
   1. See Section 31 23 23 for bedding and corrective fill materials at general excavations.
   2. See Section 31 23 16.13 for bedding and corrective fill materials at utility trenches.

B. Underground Warning Tapes:

1. See Section 22 05 53 for underground warning tapes at underground plumbing lines.
2. See Section 26 05 53 for underground warning tapes at underground electrical lines.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey benchmark and intended elevations for the work are as indicated.

B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.

C. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by Owner or Owner's Representative. If the proposed excavation extends more than 1 foot into the prevailing groundwater, control groundwater intrusion with comprehensive dewatering procedures, or as directed by Geotechnical Engineer.

D. Per IHS Section 01, TP-107 C (Removal of Water), the Contractor is strictly required to keep all excavations completely water-free until facilities are in place and sealed. The use of a standard trash pump to remove "nuisance water" is considered incidental and must be completed at no extra cost to the Owner. True "dewatering" (which is paid on a linear foot basis) is defined only when continuous pumping with well points is directed by the Owner's Representative to maintain a dry trench

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 10 00 for clearing, grubbing, and topsoil removal.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect trees and other features to remain.

G. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Owner, Owner's Representative, or Project Engineer.

3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.

3.04 EXCAVATING

A. Excavate to accommodate new structures and construction operations.
   1. Excavate to the specified elevations.
   2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
   3. Utility trench widths must be no less than 16 inches and no more than 24 inches wider than the outside diameter of the pipe barrel, centering the pipe to maintain at least 8 inches of clear space on each side.
   4. See Section 31 23 16.26 for required excavation clearances for pipes in utility trenches.
   5. Hand trim excavations. Remove loose matter.

B. Notify Owner or Owner's Representative of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 31 23 16.26 for removal of larger material.

E. Provide temporary means and methods, as required, to remove all water from excavations until directed by Owner or Owner's Representative. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.05 SUBGRADE PREPARATION

A. See Section 31 23 23 for subgrade preparation at general excavations.

B. See Section 31 23 16.13 for subgrade preparation at utility trenches.

3.06 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. Install underground warning tape at buried utilities according to Sections 21 05 53, 22 05 53, 23 05 53, and 26 05 53.

C. See Section 31 23 23 for fill, backfill, and compaction requirements at general excavations.

D. See Section 31 23 16.13 for fill, backfill, and compaction requirements at utility trenches.

E. See Section 31 22 00 for rough and fine grading.

3.07 REPAIR

A. Any unauthorized over-depths must be backfilled specifically with suitable bedding material entirely at the Contractor's expense. For structural over-excavation, it must be restored by filling with suitable granular bedding material at the Contractor's expense. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.

3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Engineer before placement of foundations.

3.09 CLEANING

A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.

B. Remove excavated material that is unsuitable for re-use from site.

C. Remove excess excavated material from site.

3.10 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 23 16.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 31 22 00 - Grading: Site grading.

C. Section 31 23 16 - Excavation: Building and foundation excavating.

D. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

E. Section 31 23 23 - Fill: Backfilling at building and foundations.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Unit Price A : Excavating Soil Materials:
   1. Measurement method: By the cubic yard.
   2. Includes: Excavating to required elevations, loading, stockpiling,removing from site, and dewatering.
   3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

C. General Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, supplying fill, placing where required, compacting, and dewatering.

D. Structural Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, supplying fill, placing where required, and compacting.

E. Granular Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, supplying fill, placing where required, compacting, and dewatering.

F. Aggregates:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, supplying fill, placing where required, compacting, and dewatering.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil–Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

G. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. See referenced Western Technologies, Inc. Geotechnical Evaluation Report for fill recommendations.

2.02 ACCESSORIES

A. Geotextile: Non-biodegradable, woven.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from the same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey benchmarks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Notify Owner or Owner's Representative and utility company of conflicts.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect trees and other features to remain.

G. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Owner or Owner's Representative.

3.03 TRENCHING

A. Notify Owner or Owner's Representative of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Open-cut trench widths for utility piping shall be no less than 16 inches and no more than 24 inches wider than the outside diameter of the pipe barrel. The trench excavation must be centered on the pipeline alignment so that a minimum clear space of 8 inches is provided on each side of the pipe.

E. Notify the Owner's Representative and Project Engineer immediately of any unexpected subsurface soil or utility conditions

F. Hand trim excavations. Remove loose matter.

G. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

H. Remove lumped subsoil, boulders, and rock up to 1/6 cubic yard measured by volume. See Section 31 23 16.26 for removal of larger material.

I. Remove excavated material that is unsuitable for re-use from site.

J. Stockpile excavated material to be re-used in area designated on site.

K. Remove excess excavated material from site.

L. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Owner or Owner's Representative. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

M. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Owner or Owner's Representative.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with appropriate fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into the excavation.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Reshape and re-compact fills subjected to vehicular traffic.

F. Place approved embedment material (from the trench bottom to 12 inches above the top of the pipe) in continuous, uniform layers not exceeding 6 inches in compacted depth. Wet to optimum moisture content and mechanically compact to at least 95% of maximum dry density (ASTM D-698 / Modified Proctor).

G. Final Backfill: Place and compact approved final backfill material in layers not exceeding 12 inches in compacted depth (or 6 inches under road subgrades) up to finished grade. C. Compaction Densities: Compact backfill based on location:

1. Type I Areas (under or within 2 feet of pavements, sidewalks, slabs, or footings): Minimum 95% of maximum dry density.
2. Type II Areas (within street rights-of-way or utility easements outside Type I limits): Minimum 90% of maximum dry density.
3. Type III Areas (all other locations): Minimum 80% of maximum dry density (or 100% of adjacent natural ground). D. Moisture Content: All compacted backfill must be maintained at plus or minus 2% of optimum moisture content.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping:
1. Bedding: Use native or structural fill, as appropriate. Check with each utility provider.
2. Cover with general fill.
3. Fill up to subgrade elevation.
4. Compact in maximum 8 inch lifts with compaction requirements as indicated in the Trautner Geotech report..

C. At Pipe Culverts:
1. Bedding: Use structural fill.
2. Cover with structural fill.
3. Fill up to subgrade elevation.
4. Compact in maximum 8 inch lifts with compaction requirements as indicated in the Trautner Geotech report.

D. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
1. Drainage fill and geotextile: Section 31 05 19.
2. Cover drainage fill with general fill, or structural fill as appropriate.
3. Fill up to subgrade elevation.
4. Compact as indicated in the Trautner Geotech report.

E. At French Drains:
1. Use granular fill.
2. Fill up to 12 inches below finish grade.
3. Compact as indicated in the Trautner Geotech report.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor") or ASTM D698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: Perform compaction density testing in accordance with IHS Section 01, TP-109 D:

1. Type I Areas: Perform at least one (1) compaction test every other lift for every 250 linear feet of trench.

2. Type II and Type III Areas: Perform at least one (1) compaction test every other lift for every 500 linear feet of trench.

3.09 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 23 16.26
ROCK REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of identified and discovered rock during excavation.

1.02 RELATED REQUIREMENTS

A. Section 31 23 23 - Fill: Fill materials.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00 - Allowances, for description of quantities of site and trench rock removal in cubic yards included in the base bid Contract Sum and adjustment of the allowance.

B. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

C. Site Rock Removal: By the cubic yard measured before removal. Includes preparation of rock for removal, explosive disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

D. Trench Rock Removal: By the cubic yard measured before removal. Includes preparation of rock for removal, explosive disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

1.04 DEFINITIONS

A. Solid Rock: Large masses of igneous, metamorphic, or sedimentary rock that, in the opinion of the Project Engineer or Owner's Representative, cannot be excavated without drilling, blasting, or the use of rippers or other specialized excavation equipment. Any material excavated without the use of blasting or specialized ripping equipment shall not be considered solid rock.

B. Loose Rock: Boulders and other detached stones each having a volume of 1 cubic yard or more. Loose rock shall not be used for backfill

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mechanical Disintegration Compound: Grout mix of recommended materials that expand on curing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.03 ROCK REMOVAL

A. Excavate and remove rock to a point 4 inches below the invert of the installed pipe.

B. Trench Bedding in Rock: Refill the excavated over-depth below the pipe invert to the required elevation with sand, gravel, or crushed rock passing a 3/4-inch mesh screen. This bedding material must extend upward at least 12 inches above the top of the pipe. This bedding and its placement are considered incidental to rock excavation, and no separate payment shall be made.

C. Structural Rock Excavation: For structures, rock shall be profiled 12 inches outside the perimeter of the structure and computed based on a product of the profile of the rock and an assumed 24 inches outside the structure's perimeter and 6 inches below the structure's footing.

D. Blasting and Explosives: The use of explosives is prohibited unless explicitly authorized in writing by the Southern Ute Indian Tribe and the Project Engineer. If blasting is permitted, the Contractor shall utilize an experienced powderman who must furnish proof of credentials, and the Contractor shall be responsible for notifying all residents in the vicinity of blasting activities prior to work.

E. Remove shale layers to provide a sound and unshattered base for footings.

F. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

G. Remove excavated materials from site.

H. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23.

3.04 FIELD QUALITY CONTROL

A. Independent agency field inspection will be provided under provisions of Section 01 40 00 - Quality Requirements.

B. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

END OF SECTION

SECTION 31 23 23
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for footings, slabs-on-grade, paving, and utilities within the building.

B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.

C. Section 31 22 00 - Grading: Site grading.

D. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

E. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

F. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Structural Fill: Applies to Unit Price B .
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2025.

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submit copies of Modified Proctor Tests with a 5-point minimum moisture vs. density curve.

C. The Contractor shall coordinate the collection of soil samples for Proctor testing with the IHS construction inspector, Owner's Representative, or Project Engineer so that both parties are on-site during collection.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type A: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

B. Structural Fill: Class 6 aggregate road base, complying with State of Colorado Department of Transportation (CDOT) standard. Refer to geotech report + Plans

C. Concrete for Fill: Lean concrete. Refer to Geotech report for additional recommendations.

D. Granular Fill - Gravel - Fill Type C: Angular crushed washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM C136/C136M, within the following limits:
      a. 2 inch sieve: 100 percent passing.
      b. 1 inch sieve: 95 percent passing.
      c. 3/4 inch sieve: 95 to 100 percent passing.
      d. 5/8 inch sieve: 75 to 100 percent passing.
      e. 3/8 inch sieve: 55 to 85 percent passing.
      f. No. 4 sieve: 35 to 60 percent passing.

E. Sand - Fill Type D: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.
   1. Graded in accordance with ASTM C136/C136M; within the following limits:
      a. 3/8-inch sieve: 100 percent passing.
      b. No. 4 sieve: Refer to Geotech Report for recommendations.

2.02 ACCESSORIES

A. Geotextile: Non-biodegradable, woven.

B. Vapor Retarder: 10 mil thick, polyethylene.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 31 22 00 for additional requirements.

D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

E. Verify structural ability of unsupported walls to support imposed loads by the fill.

F. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into the excavation.

3.03 FILLING

A. A. Fill to contours and elevations indicated using unfrozen materials.

B. Moisture Content: The backfill and fill shall be uniformly moistened or aerated to plus or minus 2% of optimum moisture content.

C. Compaction Densities: Compact all placed fill and backfill material based on location:

1. Type I Areas (under or within 2 feet of pavements, curbs, gutters, sidewalks, roadway, slabs, footings, and building foundations): Compact to a minimum of 95% of maximum dry density (ASTM D-698 / Modified Proctor).
2. Type II Areas (within gas, electric, or telephone utility easements, or within any street or road right-of-way outside Type I limits): Compact to a minimum of 90% of maximum dry density.
3. Type III Areas (all other locations): Compact to a minimum of 80% of maximum dry density (or 100% of adjacent natural ground).

D. Maintain temporary means and methods, as required, to remove all water while fill is being placed, until directed by the Project Engineer or Owner's Representative

E. Fill to contours and elevations indicated using unfrozen materials.

F. Employ a placement method that does not disturb or damage other work.

G. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

H. Maintain optimum moisture content of fill materials to attain required compaction density.

I. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

J. Correct areas that are over-excavated.

1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

L. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Owner or Owner's Representative. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill at Building Foundation:
1. Use Fill Type B.
2. Maximum depth per lift: 6 inches, compacted.
3. Compact to minimum 95 percent of maximum dry density.

C. Under Interior Slabs-On-Grade:
1. Use granular fill.
2. Depth: 4 inches deep.
3. Compact to 95 percent of maximum dry density.

D. At Foundation Walls and Footings:
1. Use general fill.
2. Fill up to subgrade elevation.
3. Compact each lift to 90 percent of maximum dry density.
4. Do not backfill against unsupported foundation walls.
5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing in accordance with IHS Section 01, TP-109 D.

C. Testing Frequency:

1. Under building foundations, interior slabs-on-grade, and structurally supported slabs, perform a minimum of four (4) compaction tests on each lift of material placed.

2. For general site fills in Type I areas, perform at least one (1) compaction test every other lift for every 250 linear feet.

3. For general site fills in Type II or Type III areas, perform at least one (1) compaction test every other lift for every 500 linear feet.

D. Soil Fill Materials:
1. Perform compaction density testing on compacted fill in accordance with ASTM D1556.
2. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor").
3. If tests indicate work does not meet specified requirements, remove work, replace and retest.
4. Frequency of Tests: Compaction tests should be performed on each lift of material placed in areas proposed for support of structural components.
5. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.07 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials; leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of site for base course.

B. Section 31 23 16.13 - Trenching: Compacted fill over utility trenches under base course.

C. Section 31 23 23 - Fill: Topsoil fill at areas adjacent to aggregate base course.

D. Section 31 23 23 - Fill: Compacted fill under base course.

E. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.

F. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices for general requirements applicable to unit prices for earthwork.

B. Coarse Aggregate or Class 2 Aggregate Base Course: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing where required, and compacting.

C. Fine Aggregate or Class 6 Aggregate Base Course: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2025.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

G. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate where directed by Owner.

C. Aggregate Storage, General:
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coarse Aggregate: Coarse aggregate shall meet the material and gradation specifications for a Class 2 ABC complying with the State of Colorado Department of Transportation current standards.

B. Medium Aggregate: Medium aggregate shall meet the material and gradation specifications for a Class 6 ABC complying with State of Colorado Department of Transportation current standards.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from the same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Spread aggregate over prepared substrate to a total compacted thickness of 8 inches.

B. See drawings for required aggregate thickness under concrete sidewalks, curbs, gutters and aprons, and asphalt paving.

C.

D. Level and contour surfaces to elevations and gradients indicated.

E. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content. All compacted aggregate base course must be maintained at plus or minus 2% of optimum moisture content.

G. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 0.04 feet.

C. Variation From Design Elevation: Within 0.02 feet.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted aggregate base course in accordance with ASTM D6938 or ASTM D1556. B. Results shall be evaluated in relation to the compaction curve determined by testing uncompacted material in accordance with ASTM D1557 (Modified Proctor). C. Compaction Density Requirements:

1. Compact base course to a minimum of 95% of maximum dry density in Type I Areas (under curbs, gutters, driveway aprons, asphalt pavements, and structural drive slabs).
2. Compact base course to a minimum of 90% of maximum dry density under standard concrete sidewalks.
3. Compact base course to a minimum of 90% of maximum dry density in Type II Areas. D. Compaction Testing Frequency:
4. Under structural pavement and curbs (Type I Areas): At least one (1) test every other lift for every 250 linear feet of installation.
5. In easements and unpaved rights-of-way (Type II Areas): At least one (1) test every other lift for every 500 linear feet.

C. Results will be evaluated in relation to the compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade and curb and gutters, asphalt paving, and concrete slabs in drive areas.

3.06 CLEANING

A. Remove unused stockpiled materials; leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This specification covers the furnishing of materials used in and the placement of the Asphaltic Concrete Surface Course (ACSC) or Hot Bituminous Pavement (HBP) or Hot Mix Asphalt (HMA). Asphaltic concrete surface course materials shall be placed in accordance with these specifications and in conformity with typical cross-sections or as established by the Owner's Representative in the field.

B. This item assumes that underlying courses have been inspected, tested, and approved by the Owner's Representative, in accordance with these specifications and accompanying plans. Due diligence should be performed in establishing conformance of underlying courses prior to the on-set of ACSC paving operations.

1.02 SUBMITTALS

A. Submit a Job-Mix Formula (JMF) prepared and reviewed by a State of Colorado Registered Professional Engineer within one year of paving operations.

B. Submit documentation of compliance and permit clearances from the Southern Ute Indian Tribe TERO office prior to starting paving work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: Asphalt cement shall be Performance Grade PG 58-28 or PG 64-22 conforming to the requirements of AASHTO and CDOT Section 702.

B. Aggregate for the asphaltic concrete surface course shall be uniform quality, composed of clean, hard, durable particles of crushed stone, crushed gravel, natural gravel, or a combination of these materials. The aggregate shall have a percentage of wear of not more than 40 when tested in accordance with the AASHTO or ASTM Standard Test Method for Abrasion of Coarse Aggregate, Los Angeles Machine. The aggregate materials shall not contain clay balls, organic matter, or other deleterious substances and will be non-plastic with a liquid limit less than 25. The fine aggregate shall have a sand equivalent greater than 45. The weighted average loss shall not exceed 10 percent when tested for soundness in a sodium solution, 5 cycles, in accordance with the applicable AASHTO or ASTM Standard Test Method. Excessive fine material shall be wasted before crushing.

C. Coarse aggregate will have not less than 80 percent one sided fracture, by weight of the particles retained on the No. 8, and not less than 70 percent shall have at least two fractured faces. Flat and elongated particles with a ratio of greater than 3 to 1 shall not exceed 10 percent of the total aggregate retained on the No. 8 sieve.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. The Contractor shall submit to the Owner's Representative a job-mix formula, tested by an AASHTO accredited materials testing laboratory for each mixture to be supplied for the project. A mixture summary must be submitted yearly to maintain commercial mixture active status. The yearly mixture summary must be prepared by an accredited laboratory and reviewed by a Professional Engineer. Any changes in aggregate or any other material sources require the development of a new Job-Mix Formula. Review and/or approval by the Owner's Representative does not relieve the Contractor of the responsibility for adhering to the specifications presented herein, should erroneous or incorrect data not be discovered by the reviewing agencies.

B. Superpave Mix Design: Asphalt mixes shall comply with the Superpave SP-III or SP-IV design parameters (CDOT Class SX or S) as approved by the Project Engineer.

C. The job-mix formula report from the accredited laboratory shall state the Marshall or Super-pave properties, optimum asphalt content, combined and individual aggregate grading, mixing and placing temperatures, aggregate characteristics, and mineral admixture or liquid anti-strip type and amount. The mixture properties, including air voids, bulk specific gravity, theoretical maximum specific gravity, voids in mineral aggregate, stability, flow, and other applicable properties shall be graphed in such a manner that the effects of variable asphalt content, between a minimum of four different asphalt contents, varying by 0.5 percent each, be plotted.

D. The job-mix formula and related data must be accepted by the Owner's Representative before the commencement of paving operations. Should a change in sources of materials be made, a new job-mix formula shall be required.

E. Job-mix formulas must be prepared and reviewed by a State of Colorado Registered Professional Engineer, within one year of paving operations. Should the job-mix formula be greater than one year old, the Contractor may present a mixture summary documenting continued adherence of the mixture to the original design. The mixture summary may consist of a one-point Trial Batch with supporting aggregate data, or a summary of test data accumulated from the previous year's mixture testing. The Trial Batch will verify all previous data presented in the original job-mix formula. If the results of aggregate specific gravity tests are within 0.02 of the original job-mix formula, additional aggregate verification tests such as Los Angeles Abrasion and Soundness are not required. However, sand equivalent, gradation, specific gravity and absorption, plasticity, and fractured face tests shall be completed and presented in the Trial Batch report, reviewed by a State of Colorado Registered Professional Engineer.

F. All job-mix formulas shall have a minimum of three individual aggregate materials, with no material constituting more than 50 percent of the aggregate blend.

G. Recycled Asphalt Paving (RAP) may be used as a portion of the job-mix with the following stipulations:

H. RAP will be used at a maximum of 20 percent of the aggregate portion.

I. RAP will be from one source and consist of a stockpile generated from one asphalt paving demolition project, with consistent properties, as determined by an accredited laboratory. Consistent, for the purposes of this specification item purpose, is defined as characteristics of gradation, aggregate durability quality, absorption, and asphalt content, which the job-mix formula design laboratory reasonably determines as consistently definable, to an extent which produces a bituminous mixture which will not be effected, to the extent defined in the production mixture tolerances for gradation or voids characteristics, directly attributable to the RAP.

J. The tested characteristics of the RAP will be presented in the job-mix formula, and include a minimum of 5 extraction gradations, 5 fractured face counts, and other tests determined by the accredited laboratory to be necessary.

K. The following parameters will be utilized in the process of developing job-mix formulas:

Sieve	Wide Band 3/4" Grading	1/2" Grading
1"	100	100
3/4"	90- 100	100
1/2"	* (6)	90- 100
#4	* (6)	* (6)
#8	23- 49 (5)	28- 58 (5)

Sieve	3/4" Grading	1/2" Grading
#30	* (4)	* (4)
#200	2- 8 (2)	2- 10 (2)
Bitumen	5.0- 7.0 (3)	5.0- 7.0 (3)
Air Voids	3.0- 5.0	3.0- 5.0
VMA	13 min	14 min
Sieve	3/4" Grading	1/2" Grading
Tensile Strength Ratio	70% min	70% min
Min. Split Tensile Strength	100 psi dry	100 psi dry
Stability (Marshall)	2000 min	2000 min
Flow (Marshall)	8-16	8- 16
Sieve	3/4" Grading	1/2" Grading
Gyrations (N des)	86 (or approved)	86 (or approved)
Marshall Blows	50	50

L. ( ) = Plus or minus tolerance from targets established in job-mix formula for production control. When no parentheses are provided indicates the production tolerances are the same as design parameters.

M. The production ranges will be based entirely upon the specific targets established in the job-mix formula. However, variation from the job-mix formula targets will be considered, providing the Contractor presents a substantiating reason for target changes in a request to the Owner's Representative. Changes in design targets must be reviewed by the accredited laboratory which developed the job-mix formula, and an opinion as to the effect on mixture quality provided by the laboratory, with respect to requested changes.

N. In addition to the job-mix formula laboratory data, a one-page design summary will be provided by the accredited laboratory, which presents all design targets indicated above, and all production tolerances based upon the ranges presented above. If production targets are requested to be changed from the design job-mix formula, a revised one-page summary will follow all job-mix formula target change requests to the Owner's Representative. **No target changes will be considered on materials, which have already been placed, unless the changes are relative to the initial test strip results.**

2.03 EQUIPMENT

A. Equipment to be used for mixing, hauling, placing, and rolling HBP will be at the discretion of the Contractor, but will comply with applicable State, Federal, and OSHA guidelines, with respect to Safety and Environmental protection.

2.04 MIXING

A. Asphalt cement shall be heated at the mixing plant to the viscosity at which it can be uniformly distributed throughout the mixture, and as denoted in the latest AASHTO, ASTM, or Asphalt Institute temperature/viscosity requirements, or the temperatures recommended by the bitumen supplier. Care shall be exercised to avoid over-heating the asphalt cement materials. Storage tanks shall be equipped with circulating pumps. For liquid anti-stripping agents, adequate and calibrated equipment will be provided at the mixing plant to ensure even and accurate additions.

B. Coarse and fine aggregate shall be handled and stored at the mixing plant in a manner that will prevent segregation of particle size and intermingling of coarse and fine aggregate. When it is necessary to blend aggregate to achieve the gradation of the job-mix formula, blending shall be accomplished by feeding aggregates from each individual stockpile through separate bins to the cold elevator feeders. Aggregates shall not be blended in the stockpiles.

C. Aggregates shall be stored in sizes that may be easily recombined into a gradation meeting the requirements of the job-mix formula. Cold aggregates shall be fed carefully to the mixing plant so that surplus and shortages will not occur, and cause breaks in the continuous operation of the plant. The aggregate and asphalt mixture shall be heated to the temperature specified in the job-mix formula.

D. Aggregate storage areas will be prepared in a manner which removes the possibility of retrieving soil or other deleterious materials during the retrieval process.

E. Mixing times shall be established in order to achieve 100 percent coating on all particles. The moisture content of the bituminous mixture shall not exceed 0.3 percent

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SPREADING AND FINISHING

A. Weather & Temperature Restrictions: Hot Bituminous Pavement (HBP) shall not be placed when weather or surface conditions prevent proper handling or compaction. HBP shall not be placed when the air temperature in the shade is less than 50°F for lifts less than 2 inches, or less than 40°F for lifts 2 inches or greater, or when the underlying substrate is frozen.

B. No asphalt concrete surface course materials shall be placed until the prime coat application, if required, has fully set and cured before the start of paving operations. The prime coat shall be allowed to cure for a minimum of 24 hours prior to the placement of asphalt concrete materials.

C. HBP shall not be placed on loose or pumping substrate materials. The mixture shall not be placed when weather or surface conditions are such that the material cannot be properly handled, finished, or compacted. The surface upon which the mixture is placed shall be reasonably free of moisture at the time such materials are spread.

D. The temperature of the asphaltic concrete surface course mixture, at the time of placement, shall be no more than 20 degrees below the target mixing temperature specified in the job-mix formula. Acceptance of the plant mixed material will be from the windrow, or behind the laydown machine.

E. At locations where the asphalt concrete surface course will abut existing asphalt pavement, the edge of the existing pavement shall be saw cut to provide a smooth, tight edge. A tack coat of approved asphalt emulsion (SS-1, SS-1H, CSS-1, or CSS-1H) shall be applied evenly and thoroughly to all pavement cuts, existing asphalt requiring overlay, cold joints (over 24 hours old), and contact surfaces of concrete gutters and manholes, prior to placing asphalt concrete against them.

F. Asphalt concrete with design finished depths no greater than three inches may be placed in a single lift to provide a nominal compacted thickness. Asphalt concrete with finished depths greater than three inches shall be placed in two lifts, or as approved by the Owner's Representative. Any asphalt layers placed over new asphalt layers within six hours of the previous lift may be done without the use of a complete tack coat, provided the materials have not, at any time, been subject to dust, debris, or water (sweeping is not allowed to subjugate the necessity for tack coating). Placing of asphalt concrete shall be as continuous as possible. Any irregularities which occur shall be corrected before compaction of the mixture.

G. HBP shall be transported and placed in a manner to minimize segregation. Segregated areas behind the paving machine shall be removed immediately at the time of discovery and replaced with fresh material before the initial rolling takes place.

H. Should transverse joints be necessary, such joints shall be formed by cutting back on the previously placed lane to expose the full depth of the course. A coating of tack coat material shall be placed on the contact surface of the joint prior to placement of additional asphalt concrete mixture against the previously placed material.

I. In areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, asphalt concrete material shall be dumped, spread and raked with hand tools to provide the required compacted thickness

3.03 COMPACTION

A. After the HBP has been spread, struck off, and surface irregularities have been adjusted, the mixture shall be thoroughly and uniformly compacted by rolling. The number, weight, and type of rollers furnished by the Contractor shall be sufficient to obtain the required compaction while the asphalt concrete mixture is in a workable condition. The Contractor may use any type of compaction equipment he deems necessary to obtain the specified density, provided a smooth surface free of irregularities, depressions, or roller marks is achieved at the completion of compaction operations. The type of compaction equipment to be used shall be that determined to be best suited to compact the material being placed, and shall be the sole responsibility of the Contractor. However, should even a small amount of surface cracking be evidenced behind the finish roll, the Owner's Representative, reserves the right to require pneumatic compaction be installed somewhere in the roller pattern, to remove mat cracking. If pneumatic compaction is required, or used voluntarily by the Contractor, environmentally safe and non-destructive (to asphalt mat) release agents shall be used on the tires so as to remove tire asphalt fine build-up. Any build-up which does occur shall be removed from the mat surface.

B. Any displacement occurring as a result of reversing the direction of a roller, or from any other causes, shall be corrected immediately by the use of rakes, and the addition of fresh asphalt concrete when required. Serious displacement, not reasonably correctable by hand work, will be removed and replaced. Rollers shall not be allowed to park at any time, on hot asphalt. Care shall be exercised in rolling not to displace the line or grade of the edges of the asphalt concrete mat. Rollers shall not pass over the unprotected edge of freshly placed asphalt.

C. Any mixture that becomes loose, broken, or displaced, or in any way is defective, shall be removed and replaced with fresh asphalt concrete which shall be compacted to conform with the surrounding areas.

D. Unless otherwise directed, rolling shall begin at the sides and proceed longitudinally, parallel to the street centerline. Each pass shall overlap a minimum of ¼ of the previous roller width. Rolling shall progress gradually to the crown of the street. When paving abuts a previously placed lane, the longitudinal joint shall be rolled first, followed by the regular procedure.

E. Rolling shall be continued until all roller marks are eliminated and compacted such that the average of all tests is not less than 92%, nor greater than 96% of the maximum theoretical

density, as determined by the AASHTO T-209 test method, and no individual test result should indicate a compaction density less than 90% of the maximum density

3.04 TESTING

A. Commercial Suppliers/Contractors who regularly provide regional mixtures will provide a test strip at the beginning of paving operations yearly. The test strip will be tested with a calibrated (calibrated with core specimens on the mixture/depth tested). The calibration will be performed by obtaining five cores (minimum 4-inch diameter) from the compacted mat, in the same specific test location as performed with the nuclear device. The five cores may be obtained from a combination of projects, if the tonnage on any single project is not sufficient. The density of the cores shall be compared to the nuclear densities and a correlation developed based upon the difference. The core tests shall govern.

B. Test strips shall be performed on every variance of asphalt thickness and accompanying correlations will be developed. When directed by the Owner's Representative, the Contractor shall core drill or saw cut samples from the compacted pavement for thickness or compaction testing.

C. The amount of control exercised by the Contractor's accredited laboratory in the process of monitoring compaction will be at the discretion of the Contractor. However, the Contractor/Supplier shall provide compaction test results a minimum of once per 500 tons of asphalt placed, on each mixture placed, regardless of the location of placement. The purpose of the testing will be to establish a continuous and consistent pattern of placement and compaction. Accordingly, a minimum of three nuclear density tests shall be performed on each mixture placed daily. The nuclear density tests shall be performed at random and may consist of a combination of small projects. Each compaction test shall represent no more than 500 tons of material placed. The Owner or Engineer may request additional compaction testing as necessary. Tests which indicate conformance to the specifications shall be compensated for by the Owner; failing tests shall be compensated for by the Contractor.

D. All lay-down "take-offs" will be monitored by the Contractor, with a ten-foot straight edge. The maximum gap between any contact points of the straight edge will be ¼". The take-offs will be reworked until the gaps between contact points, measured transverse or laterally to centerline, are within the specified tolerance.

E. The straight edge will be periodically placed on the compacted mat in a lateral direction to centerline. Should any typical crowns or dips in the mat be evident in excess of ¼", the lay-down screed or roller pattern will be adjusted such that the crown or dip is removed.

F. MINIMUM TESTING SCHEDULE FOR COMMERCIAL PLANTS AND RANDOM PLACEMENTS

Type of Test	Frequency	Specification
Asphalt Content (nuclear, burn-off, or quantitative)	1/500 tons	± .3% of Target
Gradation (Cold Feed)	1/500 tons	Allowable deviations from the approved Job-Mix Formula (JMF) targets.
Tensile Strength Ratio	1/month	Min 70%, Min 100 psi dry
Air Voids (Marshall or Superpave)	1/week	3.0% to 5.0%
Mat Density (Nuclear)	1/500 tons	92% to 96%

G. Quality Control shall be considered incidental to the cost of asphalt. It is the intent of the quality control portion of this specification to ensure quality on all projects.

3.05 METHOD AND MEASUREMENT OF PAVING

A. Payment for this item shall be made at the contract unit price per ton of Hot Bituminous Pavement installed and accepted. Payment will be made for actual tonnage supplied based on truck tickets. No payment will be made for excessive asphalt placed, or asphalt placed in areas not indicated on the plans or directed by the Owner or Engineer.

B. Separate payment will not be made for furnishing and applying tack coat or furnishing test samples and reconstructing the areas from which they are taken. Separate payment will not be made for furnishing Quality Control/Acceptance testing by the accredited testing laboratory. Separate payment will not be made for patching, and the tonnage for patching has been included in the overall quantity for this item.

C. Payment under this item shall be full compensation for furnishing all materials; mixing, hauling, placing and compacting the asphalt concrete surface course and shall include the costs of all labor, saw-cutting, equipment, storage of materials, and transportation necessary to complete the construction of the Hot Bituminous Layer in accordance with these specifications and accompanying plans. Payment under this item will also be full compensation for any necessary re-shaping and recompacting of the existing, or new Aggregate Surface Course to typical cross section in order comply with the applicable specifications in the overall contract documents

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This specification applies to the furnishing of all labor, materials, forms and equipment required to complete all concrete, cement and steel reinforcement work and related items for sidewalks, curbs, gutters, and aprons as shown on the drawings and specified herein.

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland Cement: Shall conform to ASTM C150 “Specification for Portland Cement” or ASTM C175 “Specifications for Air-Entraining Portland Cement”. Unless otherwise specified Portland cement shall be Type II.

B. Aggregates: Shall meet the requirements of ASTM C33 “Specifications for Concrete Aggregates”. Coarse aggregate shall be composed of sound, durable pieces of crushed stone or gravel, well graded from fine to coarse. Maximum size shall be 1 inch for reinforced work and 1½ inches for non-reinforced. Fine aggregate shall be well graded, clean, sharp and free from organic matter.

C. Coarse and fine aggregates shall be stockpiled, handled and measured separately. Aggregates shall be stockpiled clear of passing vehicles and in such a manner as to avoid segregation or contamination with dust, dirt, leaves or other foreign matter.

D. Water: Shall be clean, fresh and free from injurious amounts of mineral and organic substances.

E. Reinforcing Steel: Shall be deformed bars of intermediate grade with minimum yield point of 60,000 pounds per square inch, conforming to ASTM A615 “Specification for Deformed Billet Steel Bars for Concrete Reinforcement”. Deformation shall be “highbond” type, conforming to ASTM A305. Wire for concrete reinforcement shall conform to ASTM A82 cold drawn steel wire. Welded wire fabric for concrete reinforcement shall conform to ASTM A185. Reinforcing bars are to be free from grease and loose scale.

F. Admixtures: Air-entraining admixtures shall conform to ASTM C260. Water-reducing admixtures, retarding admixtures and accelerating admixtures shall not be used without the prior approval of the Engineer.

G. Pre-formed Expansion Joint Filler: Shall be of bituminous (asphalt or tar) mastic composition conforming to ASTM D994, or other as approved by the Project Engineer or Owner's Representative

H. Forms: Shall be made of plywood, hard pressed fiberboard, sized and dressed shiplap lumber or metal in which all bolt and rivet holes are countersunk so that a plane smooth surface is obtained. All lumber shall be free from knotholes, loose knots, cracks, splits, warps, and other defects affecting the strength or appearance of the finished structure. All forms shall be free of bulge and warp and shall be cleaned thoroughly before being used a second time.

I. Curing Compound: Curing compound shall be white-pigmented compound conforming to “Specifications for Liquid Membrane Forming Compounds for Curing Concrete", ASTM C309.

J. Fibrous Concrete Reinforcement: Concrete reinforcing fibers shall be 100% virgin polypropylene, collated, fibrillated fibers as supplied by Fibermesh Company, or similar. Reinforcement fibers shall be used in all concrete on this project, using the amount and type in strict accordance with the manufacturer’s recommendations. The fibers shall have a tensile strength of 70 to 100 ksi.

2.02 FORMING

A. Concrete forms shall conform to the shape, lines and dimensions of the members as called for on the drawings. Forms are to be treated with water or oil to reduce water suction from concrete. All plane form surfaces shall be so constructed that the finished concrete surfaces will be true planes free from waves and irregularities. The corners formed by the intersections of plane surfaces shall be filleted or chamfered as appropriate. Forms shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together in such a manner that they will maintain their original positions and shape under superimposed loads and the fluid pressures of the concrete.

B. Forms shall not be removed until the concrete has adequately hardened. No construction load shall be supported upon nor any shoring removed from any part of the structure under construction until the portion of the structure has attained sufficient strength to support safely its weight and the loads placed thereon. The minimum time that shall elapse between the time of placing the concrete and the removal of the forms shall conform to the recommendations of the PCA publication “Design and Control of Concrete Mixtures", Chapter 11.

2.03 STRENGTH, PROPORTIONS AND MIXING:

A. Concrete shall be proportioned and mixed to obtain a minimum compressive strength of 4,500 pounds per square inch at 28 days.

B. Consistency of concrete shall be such as to produce a plastic mix of the workability required at the location where the concrete is to be placed. Recommended slumps are as follows (based on placing without high frequency vibration):
   1. Walls and footings 2” Minimum; 5” Maximum
   2. Slabs 3” Minimum; 5” Maximum

C. When high-frequency vibrators are used, the above values shall be reduced one third.

D. Mix shall contain not less than 6 sacks (94 pounds per sack) of cement per cubic yard of concrete. The water to cement ratio must not exceed 0.48, including water in the aggregate. However, no more water shall be used than necessary to produce a workable mix.

E. Air-entraining agent shall be used in all concrete in such amounts as will effect the entrainment of 6 percent, ±1 percent, of air, by volume, of the concrete as discharged from the mixer. When calcium chloride is being used, the portion of mixing water containing the air-entraining agent shall be introduced separately into the mixer.

F. The use of calcium chloride in concrete will not be allowed for this project.

G. The Contractor shall submit the mix design to the Engineer for review and approval. Only the approved proportions shall be used. These proportions shall be valid only so long as the materials remain the same. Introduction of materials other than those used in the approved mix will require a new mix design. The Engineer will check the concrete during placing for proper workability and placement. He may require such changes as are necessary to achieve satisfactory results.

H. Mixing, if done at the construction site, shall be done in a batch mixer of approved type and capacity for a period not less than 1½ minutes after all component materials, including water, are in the drum. During the mixing, the drum shall be operated at drum speeds recommended by the manufacturer and shown on the nameplate on the machine. The entire contents of the mixer shall be removed before materials for a succeeding batch are placed therein. The concrete shall be mixed only in such quantities as are required for immediate use.

I. Ready-mixed concrete (if used) shall be mixed and delivered in accordance with the requirements set forth in “Specifications for Ready-Mixed Concrete” (ASTM C94) and/or as specified herein. Ready-mixed concrete shall conform to all requirements of these specifications as to grading of aggregate, strengths, consistency, etc. The Engineer shall have

free access to the batching or mixing plant at all times. Ready-mixed concrete shall be continuously mixed from the time the water is added until the time of use.

J. Concrete shall be delivered to the site of the work and discharged from the truck mixer or truck agitator and shall be completed within one hour after the cement comes in contact with the mixing water or with aggregates which are surface wet. In any case, the mixing operation must begin within 30 minutes after the cement has been intermingled with the aggregate. The organization supplying ready mixed concrete shall have sufficient plant and transportation facilities to assure continuous delivery of concrete at the required rate.

K. A delivery ticket shall be prepared for each load of ready-mixed concrete. The truck operator shall hand a copy of each ticket to the Engineer at the time of delivery. Tickets shall show the quantity delivered, the amount of material in the batch, the outdoor temperature in the shade, the time at which the cement was added, and the numerical sequence of delivery.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

3.03 COLD WEATHER CONCRETE WORK

A. Concrete work in cold weather shall conform for the ACI “Recommended Practice for Cold Weather Concreting” (ACI 306).

B. Do not place concrete on frozen ground. Fresh excavation should be covered with straw or other insulating material to prevent the ground from freezing until the concrete can be placed. Remove all ice and frost from forms and steel reinforcement. Contractor shall provide suitable curing temperatures. Maintain temperatures of concrete when using normal Portland cement at 70°F. for three days or 50°F. for five days. Do not allow concrete to freeze during the next four days. Cool concrete gradually at the rate of one to two degrees per hour until it reaches the outside temperature. Concrete placed during freezing weather is done at Contractor’s risk. Any frozen concrete is to be removed at Contractor’s expense

3.04 HOT WEATHER CONCRETE WORK

A. Concrete work in hot weather shall conform to the ACI “Recommended Practice for Hot Weather Concreting” (ACI 305).

B. Use cool materials in preparation of concrete batch. Sprinkle subgrade and wood forms just before placing concrete so they will not absorb water from the mix. Coarse aggregates should be sprinkled before they are added to the batch. Protect against evaporation. Do not delay in placing concrete. Place temporary covers, such as burlap kept continuously wet, over the fresh concrete immediately after striking and darbying. When ready for final finishing, uncover only a small section immediately ahead of the finishers. Cover again at once after final finish and keep cover wet. Start curing as soon as surfaces are hard.

3.05 PLACING CONCRETE

A. Immediately before placing concrete, all surfaces of foundation upon or against which the concrete is to be placed shall be free from standing water, mud and debris. All surfaces shall also be clean and free from oil, objectionable coatings, and loose, semidetached, or unsound fragments.

B. Reinforcing must be supported using precast concrete blocks, plastic chairs, or metal chairs. Rock supports shall not be allowed.

C. Concrete is to be placed in forms immediately upon completion of mixing. The top of all surfaces shall be struck to form a level surface or as otherwise specified. Concrete shall be deposited in continuous layers, the thickness of which generally shall not exceed twenty inches, and drops of more than 4 feet shall be avoided. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling.

D. Concrete shall not be moved laterally in the forms more than 3 feet. Concrete shall be deposited continuously and as rapidly as practicable until the unit of operation is completed. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the space between the bars. No concrete that has partially hardened or been contaminated by foreign matter shall be deposited in the work nor shall re-tempered concrete be used.

E. The temperature of the concrete when it is being placed shall be not more than 90°F and not less than 40°F in moderate weather, or 50°F when the mean daily temperature drops below 40°F.

F. Anchor bolts, castings, steel shapes, sleeves and other materials that are to be embedded in concrete shall be accurately positioned in the forms and securely anchored. Anchor bolts shall have sufficient threads to permit a nut to be installed on the concrete side of the form or template. A second nut shall be installed on the other side of the form or template and the two nuts shall be adjusted so that the bolt will be held rigidly in proper position. Embedment shall be clean when installed.

G. After concrete placement, surfaces not in contact with concrete shall be cleaned of concrete spatter and other foreign substances.

H. Concrete shall be compacted and worked into place by spading, puddling or internal vibration. Care shall be taken in vibrating, spading or puddling concrete to consolidate only to bring a continuous film of mortar to the surface. Consolidation shall stop before any segregation of the concrete occurs. **Vibration for concrete consolidation shall be required for structures with over one foot of concrete, unless an approved super-plasticizer admixture is utilized.**

I. Before depositing new concrete on or against concrete that has set, the existing surface shall be roughened and cleaned. Forms shall be retightened and existing surfaces saturated with water for 24 hours and then slushed with a coat of neat cement.

J. Construction joints shall be used where shown on the drawings or as approved by the Engineer. Care shall be taken in forming keyways so as not to produce thin sections of concrete that can shear off with a slight movement of the sections. Joints shall be straight and neat in appearance. Expansion, contraction and control joints shall be as shown on the plans. Joint materials cast in place must be held in place firmly so they will not be displaced during the concreting. Control joints, where shown, must be cut to the depth required, usually one-fourth to one-third of the thickness of the member

3.06 FINISH

A. Defective concrete, honeycombed areas, voids left by the removal of tie rods, ridges on all concrete surfaces permanently exposed to view or exposed to water on the finished structure shall be repaired immediately after the removal of forms unless otherwise authorized or directed. Voids left by removal of tie rods shall be reamed and completely filled with dry patching mortar. Defective concrete shall be repaired by cutting out the unsatisfactory material and placing new concrete that shall be secured with keys, dovetails, or anchors. Unless otherwise directed on the drawings or elsewhere in the specifications, exposed surfaces, exterior and interior, shall be stone smooth (free of form burrs).

3.07 CURING

A. All concrete, regardless of temperature, weather, or season, shall be protected from premature drying by water curing or by membrane curing. If concrete is cured by water curing, the

concrete shall be kept saturated with water for a period of not less than seven days after the concrete is placed, except that where the concrete is being protected from freezing, the time period for concrete saturation shall be one day less than that of the frost protection. Membrane curing of concrete shall be by application of sealing compound. Application of the sealing compound shall be in accordance with the procedures contained in the Bureau of Reclamation "Concrete Manual". The Engineer must approve Method of concrete saturation.

3.08 SPECIFIC STRUCTURES

A. **Concrete sidewalks** and sidewalk ramps shall be 4 inches thick constructed on a 4-inch layer of ABC compacted to 90% of Modified Proctor (ASTM D-1557) maximum dry density, placed in accordance with the specification entitled "Aggregate Base Course". The sidewalks shall not be placed until the ABC has been inspected and approved by the Engineer. Sidewalks shall be edged and grooved, with contraction joints ¼ inch wide and 1/3 the depth of the slab, dividing each walk into equal length sections approximately equal to the width of the walk, or as otherwise shown in the details. Sawcut contraction joints shall be 1/8 inch wide, with the other requirements being the same. Expansion joints ½ inch wide shall be placed at no greater than 100-foot intervals and shall be filled to within ½ inch of the surface with pre-formed expansion joint material cut to the required shape. Sidewalks shall have a width as indicated on the plans, unless otherwise designated by the Engineer. Sidewalk access ramps shall be constructed per the construction details in the areas shown on the plans. Individual truncated dome inserts shall be installed as shown on the plans, shall be cast iron inserts with a patina finish, and shall be appropriate for the intended application.

B. **Concrete driveway aprons** shall be 6 inches thick, reinforced as shown on the plans, and shall be constructed on a 6-inch layer of ABC compacted to 95% of Modified Proctor (ASTM D-1557) maximum dry density, placed in accordance with the specification entitled "Aggregate Base Course". The driveway aprons shall not be placed until the ABC has been inspected and approved by the Engineer. Driveway Aprons shall be edged and grooved, with contraction joints ¼ inch wide and 1/3 the depth of the slab, dividing each into equal length sections approximately equal to the width of the apron, as indicated on the plans, or otherwise designated by the Engineer. Sawcut contraction joints shall be 1/8 inch wide, with the other requirements being the same. No expansion joints shall be positioned transversely within the driveway apron sections. Driveway aprons shall be constructed from top of curb transition to top of curb transition when going from standup to driveway curb and back.

C. **Concrete curb and gutter** (including driveway gutter, valley gutter, and edge curb) shall be reinforced as shown in the plans and constructed on a 6-inch layer of ABC compacted to 95% Modified Proctor (ASTM D-1557) maximum dry density, placed in accordance with the specification entitled "Aggregate Base Course". The curb and gutter shall not be placed until the ABC has been inspected and approved by the Engineer. Expansion joints shall be located such that curbs and gutters are divided into uniform lengths not to exceed 100 feet. Longitudinal reinforcement shall be discontinuous across expansion joints, with bars terminating 3 inches from the joint on each side. Three smooth and lightly greased No. 4 dowels 24 inches long shall be centered in the slab and over the expansion joint. Form saving devices are acceptable for use across expansion joints. Contraction joints 2 inches deep on the curb and gutter shall be at 10 foot spacing, except where shorter sections are necessary for closures, but no section shall be less than 4 feet long unless approved by the Engineer. Expansion joints shall be ½ inch wide, filled to within ½ inch of the surface with pre-formed expansion joint material cut to the required shape. Pre-formed expansion joint material shall be used to separate new and existing concrete sections. Curb cuts (driveway gutter) for driveways shall be located and placed as shown on plans. Driveway gutter shall be reinforced as indicated on the plans. Valley gutter quantity includes gutter fillets outside of standard curb and gutter section.

D. **Concrete stairs** shall be reinforced and constructed as shown on the plans, including any necessary handrail

E. All of the above sections shall be finished smooth and given a light broom finish, unless otherwise indicated on the plans.

F. All exterior concrete shall have fibrous concrete reinforcement (fibermesh).

3.09 FIELD QUALITY CONTROL

A. Field Testing Frequency: Perform field testing in accordance with IHS Section 02, TP-207:

1. Compressive Strength: Take at least four (4) compressive test cylinders for each 50 cubic yards of concrete placed or portion thereof.
2. Slump and Air: Perform one (1) slump test and one (1) air entrainment test for each concrete truck.

3.10 METHOD OF MEASUREMENT AND PAYMENT

A. Payment for concrete sidewalk (including access ramps) shall be made at the contract unit bid price per square foot installed and accepted. Payment for cast iron truncated dome inserts shall be made at the contract unit bid price per square foot installed and accepted. Payment for concrete driveway aprons shall be made at the contract unit bid price per square foot installed and accepted. Payment for standard monolithic curb and gutter shall be made at the contract unit bid price per linear foot installed and accepted. Payment for concrete stairs shall be made at the contract lump sum bid price per stair structure installed and accepted.

B. Payment for items covered under this specification shall be full compensation for all forms, materials, reinforcement, labor, equipment, supplies and transportation necessary to complete the construction of each item in accordance with these specifications and accompanying plans.

C. No separate payment shall be made for rebar, expansion joint materials, joint sealant materials, curing compounds, sawcutting or other work required both for a complete product, and shall be considered subsidiary to the installation, and shall be included in the appropriate contract unit bid price.

D. Any excavations, fills, or disposal of surplus material required for the installation of items covered by this specification shall be included in the contract unit bid price. No separate payment will be made for excavation, fills or disposal of surplus material required for the installation of items covered under this specification.

END OF SECTION

SECTION 32 15 40
CRUSHER FINES PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: The Contractor shall furnish all equipment, materials and labor necessary to construct crusher fines and/or stabilized crusher fines pedestrian pavements to the line and grade as shown on the plans or as specified.

B. Related Sections:
   1. Section 32 11 23 – Aggregate Base Course

1.02 SUBMITTALS

A. Stabilized Crusher Fines Pavement: Provide a sieve analysis from a testing laboratory acceptable to the CO certifying that the proposed materials meet the specified grading requirements, and submit a minimum ½ cubic foot sample of screened crushed aggregate for color approval by the CO. The screened crushed aggregate shall be approved by the CO in writing prior to delivery of any material to the project site.

B. Stabilized Crusher Fines Pavement: Submit the manufacturer's technical data for the proposed stabilizer material for approval by the CO.

C. Paving Mockup Sample: Prepare a sample pavement section for stabilized crusher fines pavement as required. The sample section shall be the full width of the proposed pavement, with length equal to three times the width. This sample pavement section shall be approved by the CO in writing prior to placing entire section. Pavement section can become part of final product.

PART 2 PRODUCTS

2.01 SCREENED CRUSHED AGGREGATE

A. Clean, hard, durable particles or fragments of 3/8" minus select tan or gray colored crushed granite, river rock, or basalt to match existing material. Fines shall be evenly mixed throughout the aggregate. When produced from gravel, 50 percent by weight of the material retained on a No. 4 sieve shall have one fractured face.

B. The portion retained on the No. 4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96. The portion passing a No. 4 sieve shall also have a maximum liquid limit of 25 and a maximum plasticity index of 7, as determined by AASHTO T89 and AASHTO T90 respectively.

C. The crushed aggregate screenings shall be free from clay lumps, vegetable matter, and deleterious material.

D. The grading requirements for screened crushed aggregate (crusher fines) per AASHTO T11 and T27 are as follows:

Percentage by Weight Passing a Square Mesh Sieve	
Sieve Designation	**Percent Passing**
3/8 inch	100
No. 4	95-100
No. 8	75-80
No. 16	55-65
No. 30	40-50
No. 50	25-35
No. 100	20-25

Percentage by Weight Passing a Square Mesh Sieve	
No. 200	5-15

2.02 STABILIZER MATERIAL

A. A non-toxic, colorless, odorless, non-staining concentrated organic powder that binds soil and screened crushed aggregate together creating a natural-appearing firm trail surface. G3-CS 'Stabilizer' as manufactured by TechniSoil ph 877-356-2250, or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Protect all materials from moisture and damage during delivery and installation. Keep stabilizer material covered and dry. Use lightweight hauling equipment. Exercise care in using equipment, avoiding damage to existing site facilities. Review installation procedures and coordinate paving work with other work affected. All hard surface paving adjacent to porous paving areas, concrete walks and asphalt paving, must be completed prior to installation of porous paving.

B. Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen work or wet, saturated, or muddy subgrade. Protect adjacent work and surfaces from damage during porous paving installation. Protect partially completed paving against damage from other construction traffic while work is in progress. Any barricades necessary to protect the work must be constructed to allow access by emergency and fire equipment.

3.02 SUBGRADE PREPARATION

A. Prior to placing stabilized crushed aggregate, the subgrade shall be shaped, filled, graded, and compacted as specified to 95% standard proctor density. When excavation to the finished subgrade elevation results in a subgrade of unsuitable soil, the CO may direct that the unsuitable material be removed and replaced with approved material. Approved material for backfilling shall be per NMDOT SPEC 303 or other material approved by the CO.

3.03 STABILIZED CRUSHED AGGREGATE TECHNISOIL

A. Coverage Rates for G3 – Commercial Surface
   1. G3-CS will cover 10 ft²/gallon (.25 m²/litre) on average using three applications per project.
   2. 1st application will require 20 ft²/gallon (.5 m²/litre) to fully saturate aggregate before compaction.
   3. 2nd application will require 30 ft²/gallon (.73 m²/litre) as a topcoat. 3rd application requires 40 ft²/gallon (.98 m²/litre) as a final topcoat.

B. **Recommended Installation Rates:**
   1. 20 ft² per gallon (.5 m²/litre) pour-in (pre-compaction)
   2. 30 ft² per gallon (.73 m²/litre) Topcoat (post-compaction)
   3. 40 ft² per gallon (.98 m²/litre) Topcoat (post-compaction)
   4. Total Coverage 10 ft² per gallon (.25 m²/litre)

C. Installation of G3 – Commercial Surface
   1. Apply G3-CS to graded material at a rate of 20 ft²/gallon (.5 sm/L) using a standard watering can with shower head or a pressurized hand-held or backpack sprayer. For larger applications, electric, high-capacity sprayers may be used.
   2. Allow 45–90 minutes for G3-CS to fully absorb into the aggregate. Cool, overcast weather and/or shading can increase absorption time. If after 90 minutes the surface is still saturated or appears muddy, wait an additional 15–30 minutes to allow G3-CS to fully absorb before compaction.
   3. Proper compaction may not be achieved if material is too saturated and can create aesthetic blemishes.

4. Do not allow G3-PS liquid to completely dry before compacting, as this will adversely affect the overall structural and cross-linking strength.
5. After G3-CS is fully absorbed into material, compact surface layer to 95% or greater compaction using a vibratory plate compactor (typically 3–4 longitudinal passes).
6. Use a hand tamper in areas that cannot be reached by the plate compactor. If the surface looks smeared or sticks to the bottom of the compactor, wait an additional 20–30 minutes before attempting to compact.
7. If cosmetic repairs are required, use a hand tamp and/or common masonry trowel to make adjustments as needed.
8. Apply first TechniSoil G3-CS Topcoat: Apply the first topcoat 12–24 hours after the initial application or once the surface has completely dried, at a rate of 30 ft²/gallon (.73 m²/litre).
9. Apply second TechniSoil G3-CS Topcoat: Apply the second topcoat 12–24 hours after the first topcoat or once the surface has completely dried at a rate of 40 ft²/gallon (.98 m²/litre). Surface is completely dry and ready to use when it is hard to the touch. Allow 24–72 hours to fully cure.
10. Contractor to protect all work until final acceptance. Any repairs due to damage will be completed at contractor expense.

D. **Installation on Existing Surface**
1. Scarify upper 1–1.5” (2.5–3.8 cm) of surface using a tiller or rake. Surface layer material should be broken apart as close to its original gradation as possible. Clumped materials or improper separation can result in poor stabilization and compaction.
2. Amend surface layer material with additional 1” material as needed to achieve proper slope, grade, crown, and/or height.

3.04 COMPACTION

A. Immediately compact crusher fines on walk into a smooth firm surface with a self-propelled vibratory roller of sufficient weight. Maintain proper moisture content per proctor submitted by the Contractor. Rolling shall continue until all material is firmly locked and keyed together. The appearance and surface shall be uniform with all ridges removed. Surface shall not vary more than ½” when measured with a ten foot straight edge applied parallel to the centerline. Correct any variation by loosening, reshaping, and re-rolling. When finished, compacted crusher fines shall be a minimum of 3” deep. In areas where compaction with a roller is difficult, contractor to utilize hand tamping tool. In areas where there are underground pipes use extreme caution when compacting the walk to protect the underground pipes. Discuss alternative compaction methods with CO for approval if pipe hazard is anticipated.

3.05 BACKFILLING

A. Backfill excavation to finished edges with scraper spoils using backfill to hold edge of crusher fines in place.

3.06 FINISHING

A. At completion of surfacing, remove excess spoils from along walk edge and deposit on-site as directed by CO. Rake trail edges to ensure finished appearance and positive drainage away from walk and into new drainage structures as appropriate, altering grade if necessary.

3.07 ACCEPTANCE

A. Finished walk surface shall be smooth, uniform, and solid, with no evidence of chipping or cracking. Dried compacted pavement material shall be firm all the way through with no spongy areas. Loose material shall not be present on the surface initially. After the first year of use a minor amount of loose material is expected on the surface. Loose gravel on the surface, or unconsolidated crushed aggregate screenings below the surface, is evidence of improper bonding due to poor mixing or insufficient watering. Test the loose material by wetting, then tamping, and allowing it to dry. Unconsolidated areas shall be dug out and replaced with new screened crushed aggregate meeting these specifications. Patched areas shall be wetted

thoroughly and properly compacted. Patching shall be completed prior to any pavement smoothing required.

B. Significant irregularities shall be smoothed out prior to final acceptance of work. Smoothing shall be accomplished by thoroughly rewetting the rough areas and rolling with a heavy roller. Final thickness of completed pavement shall not vary more than 1/2 inch from the depth specified on the plans. Measurements may be taken by means of test holes taken at random in the finished walk surface. Correct any variations in the thickness beyond the allowable 1/2 inch variation. Crusher fines shall not vary in top surface depressions/bumps more than ¼ inch in 10 feet measured with a ten-foot straight edge.

END OF SECTION 32 15 40

SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes furnishing and installing 8-foot high vinyl-coated black chain link fencing, gates, and all associated framework, fittings, and hardware as shown on the Drawings and as specified herein.

B. Related Sections:
   1. Section 03 30 00 – Cast-in-Place Concrete (post footings)

1.02 REFERENCES

A. ASTM A392 – Standard Specification for Zinc-Coated (Galvanized) Steel Chain-Link Fence Fabric.

B. ASTM F567 – Standard Practice for Installation of Chain-Link Fence.

C. ASTM F626 – Standard Specification for Fence Fittings.

D. ASTM F900 – Standard Specification for Industrial and Commercial Swing Gates.

E. ASTM F934 – Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.

F. ASTM F1043 – Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

G. ASTM F668 – Standard Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain link fences and gates capable of withstanding the effects of gravity loads and the following lateral loads, within limits and under conditions indicated:
   1. Wind Speed: 90 mph (145 km/h).
   2. Fence Height: 8 feet (2.44 m).
   3. Wind Exposure Category: B.

B. Minimum post size, group, and spacing shall be determined in accordance with ASTM F1043 for 8-foot high framework.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data sheets, material descriptions, dimensions, and finish specifications for the following:
   1. Fence fabric (vinyl-coated, black).
   2. Posts, rails, and fittings (galvanized steel).
   3. Gates and gate hardware.

B. Shop Drawings: Show fence line locations, post spacing, gate locations and sizes, post embedment depths, footing dimensions, extension arm locations, and all connection details.

C. Samples: Provide 6-inch lengths of vinyl-coated fabric and vinyl-coated tension wire in the specified black color for approval by the Owner's Representative prior to ordering materials.

D. Product Certificates: Signed by the manufacturer certifying compliance with ASTM standards specified herein.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Experienced installer with a minimum of three (3) years of experience installing commercial chain link fencing of similar material, design, and scope.

B. All materials shall be new and shall conform to the applicable ASTM standards specified herein. No substitutions shall be accepted without prior written approval by the Owner's Representative.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for fence lines and gate locations as shown on the Drawings in relation to the property survey and site conditions. Report discrepancies to the Owner's Representative before beginning work.

B. Do not begin installation before final grading and subgrade preparation are complete.

C. Verify locations of all underground utilities prior to post excavation or drilling. Contact the local one-call utility notification service a minimum of 72 hours prior to digging.

PART 2 PRODUCTS

2.01 CHAIN LINK FENCE FABRIC

A. Fabric Height: 8 feet (2.44 m), measured between outer edges of selvages. Provide fabric in one-piece heights.

B. Steel Wire: 0.148-inch (3.76 mm) diameter wire, galvanized per ASTM A392 prior to weaving.

C. Mesh Size: 2-inch (50 mm) diamond mesh.

D. Vinyl (PVC) Coating: ASTM F668, Class 2b, PVC coating applied over galvanized steel wire. Minimum coating thickness: 10 mils (0.25 mm).

E. Color: Black, complying with ASTM F934.

F. Selvage: Knuckled at both top and bottom.

2.02 FENCE FRAMEWORK – GALVANIZED STEEL

A. All fence posts, rails, and framework shall be hot-dip galvanized steel (zinc-coated) per ASTM F1043, Group IC (Schedule 40 round steel pipe) or as required to meet the structural performance criteria of Article 1.03. Polymer coating over galvanized framing members is not required; galvanized finish is acceptable for posts and rails.

B. Terminal Posts (end, corner, and gate posts):
   1. Round galvanized steel pipe, Schedule 40.
   2. Minimum outside diameter: 2-7/8 inches (73 mm) for 8-foot fence height.
   3. Gate posts supporting gates 6 feet wide or greater: minimum 4-inch (102 mm) OD Schedule 40.

C. Line Posts:
   1. Round galvanized steel pipe, Schedule 40.
   2. Minimum outside diameter: 2-3/8 inches (60 mm) for 8-foot fence height.
   3. Maximum spacing: 10 feet (3.05 m) on center.

D. Top Rail:
   1. Round galvanized steel pipe, Schedule 40, 1-5/8 inches (41 mm) outside diameter.
   2. Provide rail in lengths to allow one sleeve-type coupler between each pair of posts; run continuously through line post caps and loop ends into terminal post rail ends.

E. Post Height: Posts shall extend to the height required to support the 8-foot fence fabric plus top rail, as shown on the Drawings. Terminal posts to be set at a height of 8 feet 6 inches above finish grade minimum.

2.03 TENSION WIRE

A. Provide vinyl-coated (black) tension wire at both the top and bottom of fence fabric.

B. Wire: 0.177-inch (4.5 mm) diameter, marcelled (coiled) galvanized steel tension wire per ASTM A817.

C. Vinyl (PVC) Coating: Class 2b, black, matching fence fabric color per ASTM F934.

D. Bottom tension wire shall be installed within 2 inches of the bottom of the fabric. Top tension wire shall be installed through line post cap loops.

2.04 FITTINGS

A. All fittings shall comply with ASTM F626 and shall be hot-dip galvanized steel. Vinyl (PVC) coating over galvanized fittings shall be black, matching the fabric color, where fittings are in contact with vinyl-coated fabric.

B. Post and Line Caps: Provide weather-tight cap for each post. Line post caps shall include a loop to receive the top rail.

C. Rail Ends and Brace Bands: Secure rails to each terminal and gate post. Provide pressed-steel brace bands.

D. Top Rail Sleeves: Pressed steel or round steel tubing, minimum 6 inches (152 mm) long.

E. Rail Clamps: Boulevard-type clamps for connecting top rail to line posts.

F. Tension Bands: Pressed steel, spaced not more than 15 inches (381 mm) apart.

G. Tension Bars: Steel, length not less than 2 inches shorter than the full height of the chain link fabric. Provide one bar for each gate and end post and two bars for each corner and pull post.

H. Tie Wires: Hot-dip galvanized steel, 0.148-inch (3.76 mm) diameter, with vinyl (PVC) black coating to match fabric. Space tie wires at maximum 18 inches (457 mm) on top rail and maximum 24 inches (610 mm) on line posts.

I. Truss Rod Assemblies (brace rods): Steel, hot-dip galvanized after threading. Provide at all terminal and gate posts.

2.05 SWING GATES

A. Gates shall comply with ASTM F900 for single or double swing gate configurations as shown on the Drawings.

B. Gate Frame Members: Round galvanized steel tubing, 1-5/8 inches (41 mm) OD minimum for gate leaves up to 6 feet wide; 2-inch (50 mm) OD for wider leaves. Corner connections shall be welded.

C. Gate Fabric: Vinyl-coated (PVC) black chain link fabric, matching fence fabric specification in Article 2.01, cut 2 inches less than the adjacent fence height.

D. Gate Hardware: Galvanized steel.
   1. Hinges: Heavy-duty, offset, ball-bearing or friction-type hinges, minimum two per leaf, capable of supporting gate leaf without sagging.
   2. Latch: Double-acting latch operable from both sides of gate. Provide padlock eye on latch.
   3. Keeper (gate stop): Provide ground-set keeper for each gate leaf to hold gate in the open position.
   4. Padlock: Owner-furnished, Contractor to verify hasp dimensions with Owner prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with the Installer present, for compliance with requirements for verified survey of property lines, final grading, and other conditions affecting performance of work.

B. Do not begin fence installation before final grading is completed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Stake all fence line locations, gate locations, and terminal post positions for review and approval by the Owner's Representative before beginning post excavation. Post spacing shall not exceed 10 feet (3.05 m) on center or line of sight.

B. Locate all underground utilities prior to digging. Contact the utility notification service as specified in Article 1.05.

3.03 POST INSTALLATION

A. Post Sleeves: Post sleeves shall be set in concrete footings prior to fence installation. Confirm sleeve locations with the Owner's Representative before the concrete pour. Core drilling will not be permitted.

B. Post Setting: Set posts plumb, aligned, and at correct spacing and height. Hold posts rigidly in position during concrete placement and curing.

C. Concrete Footings: Place concrete around post sleeves or directly around posts to dimensions shown on the Drawings. Vibrate or tamp concrete for consolidation. Slope top of concrete slightly above grade to shed water. Do not disturb posts for a minimum of 48 hours after concrete placement.

D. Footing Depth: Below the frost line per local code requirements for the project location, minimum 36 inches (914 mm) unless otherwise shown on the Drawings.

E. Terminal post footings shall be larger in diameter than line post footings as shown on the Drawings, to resist increased tension loads.

3.04 FENCE INSTALLATION

A. Install chain link fencing to comply with ASTM F567 and the requirements of this Section.

B. Top Rail: Run top rail continuously through line post caps and connect to terminal post rail ends. Splice rail between posts using sleeve-type couplers. Secure rail to loop caps with tie wire.

C. Tension Wire: Install top and bottom tension wire per Article 2.03. Pull wire taut between terminal posts. Top tension wire shall run through line post cap loops. Bottom tension wire shall be tied to each line post with not less than one tie.

D. Chain Link Fabric: Apply fabric to the outside face of the enclosing framework. Leave 2 inches (51 mm) between finish grade or surface and the bottom of the fabric. Fasten fabric to top rail, line posts, and tension wire with tie wires or clips at maximum 18-inch (457 mm) spacing on rails and 24-inch (610 mm) spacing on posts.

E. Tension Bars: Thread tension bars through fabric at all terminal, corner, pull, and gate posts. Secure to posts with tension bands spaced not more than 15 inches (381 mm) apart.

F. Brace Assemblies: Install diagonal brace assembly and truss rod at all terminal posts per ASTM F567.

3.05 GATE INSTALLATION

A. Install gates level, plumb, and secure, in full compliance with the manufacturer's written installation instructions.

B. Hang all gate leaves to provide free operation without binding, warping, or excessive deflection. Gate leaves shall open and close smoothly throughout their full swing range without interference.

C. Attach gate hardware and test each gate for proper operation of latch, hinges, and keeper. Adjust as required for smooth, quiet operation.

3.06 ADJUSTING AND CLEANING

A. Adjust all gate hardware for smooth, easy operation, free of binding, warping, or excessive deflection.

B. Lubricate hinges, latches, and all moving parts.

C. After installation is complete, remove all excess materials, cut-off post tops, wire cuttings, and debris from the site. Leave all fence and gate areas in a clean, neat condition.

D. Touch up any abraded or damaged areas of the vinyl (PVC) coating with manufacturer's recommended touch-up compound in matching black color.

1.01 END OF SECTION 32 31 13

SECTION 32 31 19
ORNAMENTAL STEEL FENCE – MONTAGE PLUS

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall provide all labor, materials, and appurtenances necessary for the complete installation of the Ameristar Montage Plus® welded ornamental steel fence system as shown on the Drawings and as specified herein.

1.02 RELATED SECTIONS

A. Section 31 20 00 – Earthwork

B. Section 03 30 00 – Cast-in-Place Concrete

1.03 SYSTEM DESCRIPTION

A. The fence system shall be an Ameristar Montage Plus® Welded and Rackable (ATF – All Terrain Flexibility) ornamental steel fence system, standard picket spacing, Classic style, 3-rail configuration with extended picket bottom rail treatment, as manufactured by Ameristar Fence Products, Inc., Tulsa, Oklahoma, or approved equal.

B. The system shall include all components required for a complete installation, including panels, posts, gates, and hardware.

1.04 QUALITY ASSURANCE

A. The Contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and the materials and techniques specified herein.

B. All materials shall conform to the ASTM standards referenced in Article 1.05. No substitutions shall be made without prior written approval from the Owner's Representative.

1.05 REFERENCES

A. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM B117 – Practice for Operating Salt-Spray (Fog) Apparatus.

C. ASTM D523 – Test Method for Specular Gloss.

D. ASTM D714 – Test Method for Evaluating Degree of Blistering in Paint.

E. ASTM D822 – Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

F. ASTM D1654 – Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

G. ASTM D2244 – Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

H. ASTM D2794 – Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

I. ASTM D3359 – Test Method for Measuring Adhesion by Tape Test.

J. ASTM F2408 – Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets.

K. IBC 2018, Section 1607.8.1 – Handrails and Guards.

1.06 SUBMITTALS

A. Submit the following prior to ordering materials or beginning installation:
   1. Manufacturer's product literature, technical data sheets, and installation instructions for all fence system components.

2. Shop drawings showing fence line locations, panel configurations, post sizes and spacing, gate locations and sizes, post embedment depths, and footing dimensions.
3. Color samples for Owner's Representative approval.
4. Manufacturer's warranty documentation.

1.07 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be inspected to confirm that no damage occurred during shipping or handling. Discrepancies shall be reported to the manufacturer immediately.

B. Materials shall be stored to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft.

1.08 WARRANTY

A. All structural fence components (rails, pickets, and posts) shall be warranted by the manufacturer for a period of 20 years from the date of original purchase against defects in material and finish, including cracking, peeling, chipping, blistering, and corrosion.

B. Labor reimbursement for restoration or replacement of components found defective under the manufacturer's warranty shall be guaranteed for five (5) years from the date of original purchase.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Ameristar Fence Products, Inc., Tulsa, Oklahoma. Montage Plus® Welded and Rackable (ATF – All Terrain Flexibility) Ornamental Steel Fence System, Classic style, standard picket spacing, 3-rail configuration with extended picket bottom rail treatment, or approved equal.

B. Approved equals must meet all material, fabrication, finish, and structural performance requirements specified herein and must be submitted for written approval by the Owner's Representative a minimum of 10 days prior to ordering.

2.02 MATERIALS

A. Steel: All steel material for fence panels and posts shall conform to ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft² (184 g/m²), Coating Designation G-60.

B. Pickets: 3/4" square x 18-gauge steel tubing, pre-cut to specified lengths.

C. Rails: Steel channel, 1.5" x 1.4375" x 14-gauge, pre-punched to accept pickets at 4.675" on center (standard picket spacing).

D. Posts and Gate Posts: Hot-dip galvanized steel, minimum sizes per manufacturer's Table 1 requirements based on fence height and gate leaf dimensions.

2.03 FABRICATION

A. Pickets, rails, and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched rail holes and aligned to standard spacing using a calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, producing a rigid panel assembly with a seamless, spatter-free appearance equally attractive from both sides.

C. Finish: Manufactured panels and posts shall receive an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment and wash, followed by a duplex application of epoxy primer and acrylic topcoat. Minimum cumulative coating thickness of epoxy and acrylic: 2 mils (0.058 mm). Color: Black.

D. Coating Performance: The coated panels and posts shall meet or exceed the performance requirements for each quality characteristic per ASTM F2408, as shown in the manufacturer's Table 2.

E. Structural Performance: The fence system shall meet the vertical load, horizontal load, and infill performance requirements for Commercial weight fences per ASTM F2408.

F. IBC Compliance: The 3-rail Classic configuration shall meet IBC 2018 compliance for Handrails and Guards (Section 1607.8.1). Panel, post, and bracket assemblies shall be tested per IBC Chapter 17 by an accredited third-party testing facility and shall demonstrate a loading capacity of 2.5 times the prescribed design loads in IBC Sections 1607.8.1, 1607.8.1.1, and 1607.8.1.2.

2.04 GATES

A. Gate leaves with an out-to-out dimension of 72 inches or less shall be fabricated using Montage Plus ornamental panel material and 1-3/4" square x 14-gauge gate ends.

B. Gate leaves greater than 72 inches shall be fabricated using ForeRunner rails, 17-gauge pickets, intermediate uprights, gussets, and 1-3/4" square x 14-gauge gate ends.

C. All rail and upright intersections shall be joined by welding. All picket-to-rail intersections shall also be joined by welding.

D. Gate hardware (hinges, latches, keepers) shall be provided by the fence manufacturer and shall be sized per the manufacturer's gate drawings based on leaf width, weight, height, and anticipated gate cycle frequency.

PART 3 EXECUTION

3.01 PREPARATION

A. All fence lines, gate locations, and post positions shall be laid out by the Contractor in accordance with the Drawings prior to any excavation.

B. Verify all underground utility locations a minimum of 72 hours before digging. Contact the local one-call utility notification service as required.

C. Do not begin installation before final grading is complete.

3.02 FENCE INSTALLATION

A. Fence posts shall be spaced per the manufacturer's Table 3, plus or minus 1/4". For installations that must rack to follow sloping grades, post spacing shall be measured along the grade.

B. Posts shall be set in concrete footings with a minimum depth of 36 inches below finish grade. Where local frost depth or soil conditions require greater depth, the more stringent requirement shall govern. Post setting by other methods (plated posts, grouted core-drilled footings) is permissible only where supported by engineering analysis demonstrating sufficient strength for the intended application.

C. Concrete footings shall conform to the requirements of Section 03 30 00 – Cast-in-Place Concrete. Verify post plumb and alignment before concrete sets.

D. Fence panels shall be attached to posts using manufacturer-supplied brackets per manufacturer's installation instructions.

E. Cut Surface Treatment: When cutting or drilling rails or posts in the field, exposed steel surfaces shall be sealed immediately as follows:
   1. Remove all metal shavings from the cut or drilled area.
   2. Apply zinc-rich primer to thoroughly cover the cut edge or drilled hole; allow to dry completely.
   3. Apply two (2) coats of Ameristar custom finish paint in matching Black color using manufacturer-supplied spray cans or paint pens. Paint pens are recommended to prevent overspray.

F. Failure to seal exposed surfaces per the steps above will void the manufacturer's warranty. Only Ameristar-supplied touch-up products shall be used. Use of non-Ameristar parts or components will void the manufacturer's warranty.

3.03 GATE INSTALLATION

A. Gate posts shall be spaced per the manufacturer's gate drawings, based on the standard out-to-out gate leaf dimensions and the gate hardware selected.

B. Gate hinge type and quantity shall be selected based on leaf weight, height, and expected number of gate cycles, per manufacturer's recommendations.

C. All gate hardware shall be installed per manufacturer's written instructions. Adjust gates after installation to swing freely and latch securely without binding or dragging.

3.04 CLEANING

A. Upon completion of work, the Contractor shall remove all excess materials, wire cuttings, post-hole spoils, and debris from the site. Post-hole excavations shall be scattered uniformly away from post locations.

B. Inspect all fence panels, posts, and gates for damage to the coating finish. Touch up any abraded or damaged areas with manufacturer's approved zinc-rich primer and Black finish paint per Article 3.02.

END OF SECTION

SECTION 32 41 20
BOULDERS AND ROCKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Landscape Boulders.

B. Cobble Mulch and Swales.

1.02 RELATED REQUIREMENTS

A. Drawings and General Provisions, Contract, and Special Provisions apply to work of this section.

B. Section 329300 Panting

1.03 SUBMITTALS

A. Submit samples of type and finish stone for use.

B. Provide samples of adequate size to indicate coloration, markings and texture.

C. Retain samples as minimum reference standard for project.

PART 2 PRODUCTS

2.01 LANDSCAPE BOULDERS AND BOULDER WALL

A. Stone: KW Stone Slab boulders

B. Stone – Landscape boulders. Color: Available. Source: Local source within 60 miles.

C. Surface Finish: Free of loose or flaking material.

D. Size Range:
   1. Minimum size for boulders as shown on details.

2.02 COBBLE

A. Stone: Washed river cobble. Color: Available. Source: Local source within 60 miles.

B. Surface Finish: Free of loose or flaking material.

C. Size Range:
   1. Minimum size for cobble to be 8 inches diameter.

PART 3 EXECUTION

3.01 PREPARATION

A. Establish lines, levels and coursing. Protect from disturbance.

B. Ensure items built-in by other Sections for this work are properly located and sized.

3.02 INSTALLATION

A. Prior to erection, clean stone, leaving edges and surfaces free of dirt or foreign matter. Do not use wire brushes or implements which would mark or damage exposed surfaces.

B. Erect stone in accordance with drawings. Compact and level base materials, erect plumb, accurately in position.

C. Avoid soiling, chipping or defacing finished surfaces.

3.03 CUTTING AND FITTING

A. Obtain Owner's Authorized Representative's approval prior to cutting or fitting any area which is not indicated on drawings, or which may impair appearance or strength of stone work.

END OF SECTION

SECTION 32 84 00
IRRIGATION SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment, and transportation required for the complete installation of a fully automatic underground irrigation system as shown on the Drawings and as specified herein.

B. The system shall be designed for 100% head-to-head coverage for all turf areas. Shrub and planting bed areas shall be served by drip irrigation as indicated on the Drawings.

C. The Contractor shall coordinate all work with other trades and shall verify all utility locations prior to excavation.

1.02 SUBMITTALS

A. Submit shop drawings indicating layout of all irrigation components, pipe sizes, head spacing, valve locations, controller locations, and drip irrigation zones prior to installation.

B. Submit product data for all irrigation equipment proposed for installation, including manufacturer's literature and installation instructions for the following:
   1. Backflow preventer
   2. Controller and central control system
   3. Zone valves
   4. Sprinkler heads and nozzles
   5. Drip irrigation components
   6. Pipe and fittings

C. Submit record drawings (as-builts) upon completion of work, accurately showing all pipe locations, valve locations, head locations, wire routing, and sleeve locations.

D. Contractor shall furnish the Owner's Representative with the following upon project completion:
   1. One (1) quick coupler key with hose swivel
   2. One (1) drain key
   3. Two (2) controller keys
   4. One (1) valve box key
   5. Two (2) sprinkler head wrenches for each type of head used

1.03 QUALITY ASSURANCE

A. All work shall conform to applicable local codes and ordinances and the standards of the Irrigation Association (IA).

B. The Contractor shall be licensed in the State of Colorado for irrigation installation work and shall have a minimum of five (5) years' experience installing systems of similar scope and complexity.

C. All equipment and materials shall be new and free from defects. Brand names and model numbers specified herein establish the standard of quality required. Substitutions must be approved in writing by the Owner's Representative prior to installation.

D. Inspections: The system shall be inspected and approved by the Owner's Representative at the following stages:
   1. Sprinkler location staking prior to trenching
   2. Main line installation and pressure testing prior to backfill
   3. Lateral line and head installation prior to backfill
   4. Final operational coverage test

PART 2 PRODUCTS

2.01 WATER SERVICE AND BACKFLOW PREVENTION

A. Water Tap: All taps into water mains shall be made by the Owner or approved contractor in accordance with local utility requirements.

B. Meter Pit: A meter pit or vault designed specifically for water meters shall be installed per local utility standards if required.

C. Backflow Preventer: Shall be a FEBCO 825 Series reduced pressure backflow preventer or approved equal, sized per local requirements. Installation shall comply with the Uniform Plumbing Code and applicable state and local regulations. Features shall include:
   1. Marine grade aluminum alloy construction
   2. 100% stainless steel internal hardware
   3. Locking security enclosure (Strongbox or approved equal), sized per manufacturer's recommendations

D. A quick-coupler blow-out valve shall be provided downstream of the backflow preventer on the main irrigation line for system winterization.

2.02 PIPE AND FITTINGS

A. Primary Water Service Line:
   1. Lines 2" and smaller: Type K seamless copper tube per ASTM B88.
   2. Lines greater than 2": Ductile iron, installed per manufacturer's specifications.
   3. Water service lines of Schedule 80 PVC may be used for lines 2" and smaller where approved by the Owner's Representative.

B. Irrigation Main Line:
   1. Minimum size: 1" diameter.
   2. Lines 2" and smaller: Schedule 40 PVC, solvent-welded joints using recommended PVC cement and primer.
   3. Lines 3" and larger: Class 200 PVC with gasket O-ring joints, installed per manufacturer's specifications.

C. Lateral Lines: Schedule 40 PVC, solvent-welded. Minimum size as required to maintain operating pressure at each head.

D. Drip Supply Lines: Refer to Article 2.06 – Drip Irrigation System.

E. Fittings: All main line and lateral line fittings 2" and smaller shall be Schedule 40 PVC socket-type fittings. No insert fittings shall be used on PVC pipe.

2.03 CONTROLLERS

A. Provide a Rainbird ESP-LXME2 (or approved equal) commercial-grade, modular, multi-zone controller capable of independent programming for each zone. Controller shall be compatible with the Rainbird central control (IQ) system.

B. Controller features shall include:
   1. Manual advance switch
   2. Lightning surge protection
   3. Manual operating mode
   4. Stainless steel enclosure with locking cover
   5. Separate program capability for turf and drip zones

C. Controllers shall be properly grounded with an 8-foot ground rod and mounted on a concrete pad per manufacturer's recommendations. Location shall be approved by the Owner's Representative prior to installation.

D. Each controller shall have a laminated zone map showing head layout, valve numbering, and as-built pipe routing affixed to the inside of the controller door.

2.04 ZONE VALVES

A. Zone valves shall be Rain Bird PESB Series (Plastic Electric Solenoid Valve, Brass Bonnet) or approved equal. Valves shall be industrial/commercial diaphragm type with a contamination-proof filter screen and manual flow-control adjustment.

B. All zone valves shall be sized to match the flow requirements of each zone and shall be installed in Ametek, Carson, or approved equivalent plastic valve boxes set flush with finished grade. Boxes shall be labeled with zone number.

C. Valve boxes shall be set in a gravel sump and the lids shall be secured with a stainless steel bolt to deter vandalism.

D. Separate zone valves shall be provided for turf zones, shrub/bed drip zones, and tree drip zones as indicated on the Drawings.

2.05 SPRINKLER HEADS – TURF AREAS

A. Turf areas shall be irrigated with Rain Bird 5004 Series pop-up rotary sprinkler heads with matched precipitation rate (MPR) nozzles. Head spacing and arc patterns shall be per the Drawings for 100% head-to-head coverage.

B. Rain Bird 5004 features shall include:
   1. 4" pop-up height minimum (6" in areas subject to tall turf growth)
   2. Rubber cover and wiper seal to prevent debris intrusion
   3. Built-in check valve to prevent low-head drainage
   4. Arc adjustable from 40° to 360°
   5. Radius adjustable from 25 to 50 feet (nozzle-dependent)
   6. Stainless steel retract spring

C. All sprinkler heads shall be installed with approved swing joints. Rain Bird SJ-EXT Series or Lasco swing joints shall be used. Swing joints shall allow for adjustment of head elevation after installation.

D. All heads shall be set flush with finished grade (turf areas) or 2" above finished grade (groundcover areas). Heads in paved areas shall be installed with protective donut rings.

2.06 DRIP IRRIGATION SYSTEM

A. Drip irrigation shall be provided for all shrub planting beds, perennial beds, and individual tree watering as indicated on the Drawings. The system shall be Netafim or approved equal.

B. Netafim Techline CV Subsurface Drip Tubing (for planting beds):
   1. Netafim Techline CV 0.9 GPH pressure-compensating dripline with built-in check valve emitters, or approved equal.
   2. Emitter spacing: 12" on center for dense groundcover and shrub beds; 18" on center for sparse planting.
   3. Tubing shall be installed at 2" to 4" depth below mulch layer in planting beds, per manufacturer's installation guidelines.
   4. Tubing shall be held in place with Netafim T-stakes or approved equal at maximum 3-foot intervals.
   5. Each drip zone shall be provided with a Netafim or equivalent filter (200-mesh minimum), pressure regulator set to 25 PSI, and air/vacuum relief valve at the highest point in each zone.

C. Drip Supply Lines:
   1. Main supply to drip zones: Schedule 40 PVC or polyethylene tubing as appropriate per zone size.
   2. Distribution tubing within beds: 3/4" or 1" blank polyethylene header tubing (Netafim or approved equal) with barbed fittings for dripline connections.

D. Each drip zone shall include an end cap with flush valve to facilitate flushing and winterization. Flush valves shall be accessible at the end of each dripline run.

E. A Netafim (or approved equal) 200-mesh disc filter and pressure regulator assembly shall be installed at the inlet to each drip zone, downstream of the PESB zone valve.

2.07 FIELD WIRING

A. Lead wire connecting controllers to zone valves shall be UF (direct burial) single-strand copper wire, sized per manufacturer's requirements. Minimum #14 AWG for runs up to 1,000 feet; #12 AWG for longer runs.

B. Common wire shall be #12 AWG UF single-strand, direct burial, PVC-jacketed copper wire.

C. Contractor shall provide six (2) spare field wires and one (1) spare common wire to the end of all main line wire runs.

D. All wire splices shall be made in designated splice boxes using waterproof wire connectors (3M DBR/Y or approved equal). Splices shall not be made in valve boxes.

E. At every 500 linear feet of wire run, a 3-foot service loop shall be provided.

2.08 MISCELLANEOUS EQUIPMENT

A. Quick Coupler Valves: Rain Bird 44 Series or approved equal, installed per Drawings. All main lines shall have quick coupler valves at maximum 300-foot intervals.

B. Isolation Valves: Ball valves shall be installed at locations shown on the Drawings and at all points of connection to the water service. Valves shall be full-port, brass construction with PVC slip connections.

C. Pressure Reducing Valves: Shall be installed where system pressure exceeds the operating range of zone valves or sprinkler heads, as required by site conditions.

D. Manual Drain Valves: Ford FIP or approved equal, minimum 3/4" diameter. Each drain shall discharge into a gravel sump of minimum 3 cubic feet. Access sleeve shall be 2" PVC with cap set in a 10" diameter valve box.

E. Sleeves: All piping and wiring crossing beneath sidewalks, curbs, driveways, or other hardscape shall be sleeved in PVC SDR-26 or heavier pipe, minimum 1" larger than the pipe or wire bundle. Pipe and wire sleeves shall be separate.

PART 3 EXECUTION

3.01 SITE CONDITIONS

A. The Contractor shall verify all utility locations prior to excavation. Contact the local one-call utility notification service a minimum of 72 hours prior to any digging.

B. The Contractor shall coordinate work with other subcontractors to avoid conflicts and minimize disruption to other work in progress.

C. Changes to the system required to meet field conditions shall be submitted to the Owner's Representative for approval prior to implementation.

3.02 INSTALLATION

A. Staking: Prior to excavation, the Contractor shall stake all proposed pipe alignments, head locations, and valve locations for review and approval by the Owner's Representative. No trenching shall begin until staking is accepted.

B. Trenching:
   1. All pipe shall be installed in excavated trenches. Trenches shall be dug true to alignment and grade.
   2. Minimum cover: 18" for main lines; 12" for lateral lines; 6" for drip supply lines.
   3. Separate trenches shall be provided for each pipe line. No doubling up of lines in a single trench.
   4. No trench shall be left open overnight without prior approval by the Owner's Representative.

C. Pipe Assembly: Pipe assembly shall follow manufacturer's recommendations and Irrigation Industry Standards. All solvent-weld joints shall be properly primed and cemented. Allow adequate cure time before pressurizing.

D. Control Valves: Zone valves shall be installed 12" to 24" below grade in valve boxes set flush with finished grade.

E. Sprinkler Heads: Heads shall be set at finish grade elevation and installed with swing joints per Article 2.05. Heads in turf areas shall be set flush with grade. Final adjustment of arc and radius shall be performed during the coverage test.

F. Drip System Installation:
   1. Dripline tubing shall be installed after planting operations are complete and prior to mulching.
   2. All dripline shall be flushed prior to connection of end caps. Flush until water runs clear.
   3. Filter and pressure regulator assemblies shall be installed per manufacturer's instructions.
   4. Upon completion, the entire drip system shall be operated and checked for proper emitter function, leaks, and pressure.

G. Backfill: Backfill shall consist of rock- and debris-free soil, compacted to match surrounding grade. Backfill shall be mechanically compacted in maximum 6" lifts in areas subject to traffic or paving.

3.03 TESTING AND INSPECTION

A. Main Line Pressure Test: After main line installation and prior to backfill, pressure-test the main line at 150 PSI static pressure for a minimum of 2 hours. No pressure drop greater than 5 PSI shall be permitted.

B. Coverage Test: After all heads are installed and the system is fully operational, conduct a coverage test in the presence of the Owner's Representative. Adjust all heads for arc, radius, and elevation to achieve uniform coverage with no dry spots.

C. Drip System Check: Operate all drip zones and verify that all emitters are functioning, that no leaks are present at fittings, and that pressure at the end of each zone is within the acceptable range per manufacturer's specifications.

D. The Contractor shall notify the Owner's Representative for inspections at each of the following stages: sprinkler location staking; main line installation; lateral line and head installation; final coverage test. No work shall be covered without inspection and approval.

3.04 SYSTEM STARTUP AND WINTERIZATION

A. Upon completion of the project, the Contractor shall perform a complete system startup in the presence of the Owner's Representative, demonstrating operation of each zone, controller programming, and proper function of all components.

B. The Contractor shall train the Owner's Representative on controller operation, zone programming, and seasonal adjustment of run times.

C. During the warranty period, the Contractor shall be responsible for spring startup and fall winterization (compressed air blow-out) of the entire irrigation system. A minimum of one (1) startup and one (1) winterization shall be performed each year of the warranty period.

3.05 WARRANTY

A. The Contractor shall warrant the entire irrigation system, including all equipment, materials, and workmanship, for a period of one (1) year from the date of Substantial Completion.

B. Any settling of backfilled trenches during the warranty period shall be repaired by the Contractor at no cost to the Owner.

C. The Contractor shall repair or replace any defective equipment, material, or workmanship within ten (10) days of written notification from the Owner's Representative.

1.01 END OF SECTION 32 84 00

SECTION 329113 SOIL PREPARATION

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. The Work of this Section includes preparation of soil for the purpose of amending the soil for irrigated sod and shrub bed areas, turf areas and raised planters.
   1. Soil preparation consists of ripping, fertilizing, soil conditioning and fine grading the topsoil. Soil preparation as specified herein MUST precede all sodding, and planting.

B. Related Work:
   1. Division 01 Section 01 30 00 Submittals
   2. Division 32 Section 32 92 23 Sod Installation
   3. Division 32 Section 32 93 00 Planting Trees, Shrubs, and Groundcovers
   4. Division 32 Section 32 91 19 Topsoil

1.03 SUBMITTALS

A. See Division 01 Section 01 30 00 Submittals for submittal requirements.

B. Product Data: For each type of product.
   1. Include recommendations for application and use.
   2. Include test data substantiating that products comply with requirements.
   3. Include sieve analyses for aggregate materials.
   4. Material Certificates: For each type of soil amendment and fertilizer before delivery to the site, according to the following:
      a. Manufacturer's qualified testing agency's certified analysis of standard products.

C. Samples: For each bulk-supplied material, 1-gallon volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

D. Quality Control Submittals:
   1. Certificates: State, Federal and other inspection certificates shall accompany invoice for materials showing source or origin. Submit to Owner’s Representative prior to acceptance of material.
   2. Material Analysis: Provide soil conditioner analysis performed no more than three months prior to delivery to site.
   3. OMRI Certificate: Provide Certificate of all fertilizers, herbicides and pesticides that comply with OMRI standards.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Fertilizer: All fertilizers, herbicides and pesticides must comply with OMRI standards. Deliver organic fertilizer to site in original unopened containers bearing manufacturer’s guaranteed chemical analysis, chemical name, trade name, trademark and conformance to state law, bearing name and warranty of producer.

B. Notify Owner’s Representative of delivery schedule in advance so material can be inspected upon arrival at project site. Immediately remove unacceptable material from project site.

1.05 PROJECT/SITE CONDITIONS

A. General: Do not perform work when climate and existing site conditions will not provide satisfactory results. Do not amend wet, muddy or frozen soil or use amendments in those states. Do not place amended soil on wet, muddy or frozen sub-grade. Do not place soil or amendments at the end of the growing season without sufficient time to provide proper cover.

B. Vehicular site access shall be limited to the area(s) indicated on the drawings or as defined by the Owner's Representative.

C. Damage to lawns, natural areas, pavements, irrigation systems, underground utilities, and other improvements shall be repaired by the contractor at no additional cost to the Owner.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
   1. Laboratories: Subject to compliance with requirements:
      a. Colorado Analytical, Brighton, Colorado 303.659.2313.
   2. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

1.07 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency approved by the Owner's Representative to perform preconstruction soil analyses on existing or imported soil.

B. Imported Soil Analyses: For each unamended imported soil source, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
   1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.08 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by Contractor in presence of Owner's Representative under the direction of the testing agency.
   1. Number and Location of Samples: Minimum of 3 representative soil samples from varied locations in the project.
   2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
   3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
   4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.09 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:
   1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
      a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
      b. Hydrometer Method: Report percentages of sand, silt, and clay.
   2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
   3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."

4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).

C. Chemical Testing:
1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT NCR-13, including the following:
1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.
3. Soil reaction (acidity/alkalinity pH value).
4. Buffered acidity or alkalinity.
5. Nitrogen ppm.
6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm and sodium absorption ratio.
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PRODUCTS

2.01 MATERIALS

A. Topsoil: Shall be as specified under Section 329119 - Topsoil.

B. Soil Conditioner:
   1. Composted material shall consist of aged organic matter, free of weed or other noxious plant seeds, lumps, stones, or other foreign contaminants harmful to plant life, and having the following characteristics based on a nutrient test performed no longer than 3 months prior to its incorporation into the project:
      a. Organic matter: 25% maximum.
      b. Salt content: 5.0 mmhos/cm maximum.
      c. pH: 7.5, maximum.
      d. Carbon to nitrogen ratio shall be less than 20:1.
   2. Mountain peat, aspen humus, gypsum and sand will not be accepted.
   3. Acceptable product: Class I compost, such as Ecogro or Bio-comp, as produced by A1 Organics, Eaton, CO, or approved equal.
   4. If a site is unable to be tilled as determined by the Owner's Representative, then the following products shall be used as a soil conditioner and must be allowed by OMRI:
      a. Organic slow release fertilizer (6-1-1), acceptable product: "Biosol" or approved equal.
      b. Granular Humic Acid soil conditioner, acceptable product: "Menefee Humate Soil Conditioner".
      c. Mycorrhizal Granular Inoculum. Acceptable product: "MycoApply Endo Granular"**.**
      d. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.
      e. Mycorryzal Inoculant: AM-120, as manufactured by Reforestation Technologies International, locally available from Pawnee Buttes Seed, Greeley, CO, (970)356-7002.
      f. 2.2 SOIL CONDITIONER APPLICATION RATES
      g. A.Irrigated Turf Sod:
      h. 1.4 cubic yards of compost per 1000 SF
      i. B.Shrub and Perennial Beds:
      j. 1.8 cubic yards of compost per 1000 SF

2.02 2.3FERTILIZER

A. AGeneral:
   1. Fertilizer shall conform to applicable State fertilizer laws and be OMRI organic certified. It shall be uniform in composition, dry, and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Fertilizer that has become caked or damaged will not be accepted.

B. BTurf Grass Lawns:
   1. (10-2-8). OMRI certified fertilizer. Provide data sheet for approval.

2. Organic RICHLAWN ORGANIC 100 8-2-1 fertilizer shall be uniformly broadcast over new sod with a suitable mechanical spreader at the rate of 436 lbs./acre (10 lbs./1000 sq. ft.).

2.03 2.4OTHER MATERIALS

A. A. Enhanced Calcitic Limestone: Verde-Cal (or approved equal), apply at manufacter's recommended rate, frequency, and specifications. Evaluate need for Verde-Cal based on soil test results. If needed, submit proposed application rate recommended by manufacturer for this project's specific soil to Owner's Representative to review prior to installation.

EXECUTION

3.01 EXAMINATION

A. General: Verify that existing site conditions are as specified and indicated on drawings before beginning work under this Section.
   1. Grades: Inspect to verify rough grading is within +/- 0.1-foot of grades indicated and specified.
   2. Damaged Earth: Inspect to verify that soil rendered unfit to support planting due to concrete, water, mortar, limewater or any other contaminant dumped on it has been removed and replaced with clean soil from a source approved by the Owner's Representative.

B. Unsatisfactory Conditions: Report in writing to General Contractor with copy to Owner's Representative.

C. Acceptance: Beginning of installation means acceptance of existing conditions by installer.

3.02 PREPARATION

A. Areas of Newly Placed Topsoil:
   1. Protection:
      a. Locate sewer, water, irrigation, gas, electric, phone and other pipelines or conduits and equipment prior to commencing work.
      b. Contractor shall be responsible for proper repair to landscape, utilities, walls, pavements and other site improvements damaged by operations under this section.

B. Weed Control: Perform mechanical methods of weed removal over the entire planting area.
   1. Surface Grade: Establish grades as indicated on drawings.
   2. Remove weeds, debris, clods and rocks larger than one 1-inch. Remove and dispose of accumulated materials at direction of Owner's Representative.
   3. Erosion Control: Take measures and furnish equipment and labor necessary to control the flow, drainage and accumulation of water, and prevent soil erosion, blowing soil and accumulation of wind-deposited material on the site throughout duration of work. Insure that all excess water will run off the grades or will percolate within 12 hours.
   4. Soil Testing: Soil amendments shall meet the minimum amounts as specified in Article 3.3, "Installation", below. Unless determined by the Owner's Representative, the Contractor shall be responsible for performing horticultural soil tests on a minimum of 4 current soil samples for each source of topsoil to be used in the project. Soil test will be used to determine the type and amount of soil organic amendment and fertilizer to be applied prior sodding and planting. Locations for testing shall be approved by the Owner's Representative.
   5. Timing: Perform soil preparation just prior to planting operations and in accordance with final planting schedule. Coordinate with irrigation system installation to avoid damage.

C. Subgrade: Hand pick all visible rocks, 2" or larger, out of the subgrade before topsoil is placed. Dispose of accumulated debris at direction of Owner's Representative.

D. Surface Grade: Remove weeds, debris, clods and rocks larger than ½". Dispose of accumulated debris at direction of Owner's Representative.

E. Areas of Compacted Topsoil: Areas within the work limits or as defined on Drawings or by the Owner's Representative that have vegetation that is sparse, stunted, anemic, weedy or was used as a construction staging, parking area and/or subjected to heavy use will require ripping to prepare the soil for revegetation. Scarify compacted soil to a 6-inch depth minimum to loosen topsoil.

F. Areas of Disturbed Topsoil: Areas disturbed but not severely compacted as determined by the Owner's Representative, shall be deep tine aerated or shattered to prepare the soil for revegetation.

3.03 INSTALLATION

A. Install topsoil as required in Topsoil Specification Section 329119.

B. Soil Preparation in Turf Grass Areas:
   1. Apply amendments at the following rates:
      a. Soil conditioner: 4 cubic yards per 1000 square feet. If a granular soil conditioner is being utilized the product shall be applied per the manufacturer's recommendations.
      b. Organic Fertilizer: 2 pounds of nitrogen per 1000 square feet.
   2. After applying soil conditioner and fertilizer, thoroughly till area to depth of 6-inches minimum by plowing, rototilling, harrowing, or disking until soil is well pulverized and thoroughly mixed. Hand pick any rocks over ½" that have been exposed by tilling.

C. Soil Preparation in Shrub/Perennial Bed Areas:
   1. For bidding purposes only:
      a. Topsoil (on-site or imported): 6" depth.
   2. For actual installation:
      a. Apply topsoil in perennial and groundcover beds to a depth of 12". Add soil amendments as outlined in this section to amend topsoil.
   3. Thoroughly till the area to depth of 6-inches minimum by plowing, rototilling, harrowing, or disking until soil is well pulverized and thoroughly mixed. If a soil conditioner is to be applied ensure that the product is spread evenly across the area to be planted and mixed thoroughly into the soil.

D. Fine Grading in all Landscape Areas:
   1. Complete fine grading for all areas prior to sodding or planting. Allow for natural settlement.
   2. For ground surface areas surrounding buildings to be landscaped, maintain required positive drainage away from buildings.
   3. Establish finish grades to within plus or minus 0.10-foot of grades indicated, in order to prevent "bird-baths" or ponding.
   4. Finish grade shall be below edge of pavement prior to sodding or planting.
      a. Sodded Areas: Allow 1-1/2-inches for sod.
      b. Shrub Beds: Allow 4-inch for mulch.
   5. Noxious weeds or parts thereof shall not be present in the surface grade prior to sodding.
   6. Compaction of Surface Grade Prior to Landscape Installation: Firm, but not hard, 75% - 85% standard Proctor density within 2% optimum moisture.
   7. Hand Raking:
      a. Turfgrass Lawn Areas: Prior to acceptance of grades, hand rake to smooth, even surface, free of debris, clods, rocks and organic matter greater than 1-inch.
   8. Restore planting areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Contractor is responsible for specified tests.

C. Perform the following tests:
   1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 1000 sq. ft.

D. Soil will be considered defective if it does not pass tests.

E. Prepare test reports.

F. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

G. Inspection: Provide notice to the Owner's Representative requesting inspection at least 7 days prior to anticipated date of completion.

H. Contractor shall be responsible for coordinating soil preparation inspections with any other necessary utilities or agencies, call at least 72 hours prior to installing sod or plantings.

I. Deficiencies: The Owner's Representative will specify deficiencies to Contractor who shall make satisfactory adjustments and shall again notify Owner's Representative for final inspection.

3.05 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove debris and excess materials from site. Clean out drainage inlet structures. Clean paved and finished surfaces soiled as a result of work under this Section, as directed by the Owner's Representative.

3.06 PROTECTION

A. Provide and install barriers as required and as directed by Owner's Representative to protect completed areas against damage from pedestrian and vehicular traffic until acceptance by Owner.

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Vehicle traffic.
   4. Foot traffic.
   5. Erection of sheds or structures.
   6. Impoundment of water.
   7. Excavation or other digging unless otherwise indicated.

C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Owner's Representative and replace contaminated planting soil with new planting soil.

END OF SECTION 32 91 13

SECTION 32 91 19
TOPSOIL PLACEMENT AND GRADING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes furnishing, placing, and fine-grading topsoil in all planting and lawn areas as shown on the Drawings, including the following:
   1. Salvage, stockpiling, and redistribution of on-site topsoil where indicated.
   2. Import and placement of topsoil from approved off-site sources.
   3. Soil testing of both on-site and imported topsoil.
   4. Incorporation of soil amendments as required by soil test results.
   5. Fine grading of topsoil to finished grades shown on the Drawings.

B. Related Sections:
   1. Section 32 91 13 – Soil Preparation
   2. Section 32 92 23 – Sod
   3. Section 32 93 00 – Planting – Trees and Shrubs

1.02 REFERENCES

A. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils.

B. ASTM D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.

C. ASTM D2974 – Standard Test Methods for Measuring the Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.

D. ASTM D4972 – Standard Test Method for pH of Soils.

E. Colorado Department of Agriculture – Noxious Weed Regulations, current edition.

F. Colorado State University Extension – Soil and Crop Sciences Laboratory standards for agronomic soil testing.

1.03 DEFINITIONS

A. Topsoil: The upper layer of soil that is fertile, friable, and capable of sustaining vigorous plant growth. For purposes of this Section, topsoil shall meet all physical and chemical requirements specified in Part 2.

B. Salvaged Topsoil: Topsoil stripped from within the construction limits and stockpiled for reuse on the project.

C. Imported Topsoil: Topsoil obtained from an approved off-site source and delivered to the project site.

D. Soil Amendment: Material incorporated into the topsoil to modify its physical or chemical properties to meet the requirements of this Section.

1.04 SUBMITTALS

A. Submit all items listed below a minimum of 14 days prior to delivery of topsoil to the project site. No topsoil shall be delivered or placed until all required submittals have been reviewed and approved by the Owner's Representative.

B. Source Information: For each proposed topsoil source (salvaged and imported), submit the following:
   1. Specific legal description or GPS coordinates of the property from which topsoil will be stripped.
   2. Name and contact information of the current property owner.
   3. Name and contact information of the topsoil supplier (if commercially sourced).
   4. Estimated volume available and proposed delivery schedule.
   5. Description of the site history (agricultural use, previous contamination, weed history).

C. Soil Test Reports: Submit certified laboratory soil test reports for each proposed topsoil source per Article 1.06. Test reports shall be prepared by a certified soil testing laboratory and shall include all parameters listed in Article 2.01.

D. Soil Amendment Data: If soil tests indicate amendments are required, submit the following for each proposed amendment:
   1. Product name, manufacturer, and product data sheet.
   2. Guaranteed analysis (nutrient content, pH, organic matter content).
   3. Recommended application rate from the testing laboratory.
   4. Material Safety Data Sheet (SDS) as applicable.

E. Topsoil Samples: Submit a minimum 1-gallon sample of topsoil from each proposed source in a sealed, labeled container for visual review by the Owner's Representative. Approval of the sample is required before topsoil from that source may be delivered.

F. Weed-Free Certification: Submit a written statement from the topsoil supplier certifying that the topsoil source is free from noxious weeds as listed by the Colorado Department of Agriculture, and free from invasive plant species.

G. Stockpile Location Plan: If topsoil is to be salvaged and stockpiled on site, submit a plan showing proposed stockpile locations for Owner's Representative approval prior to grading operations.

1.05 QUALITY ASSURANCE

A. Testing Laboratory: All soil testing required by this Section shall be performed by a certified commercial soil testing laboratory with demonstrated experience in agronomic and landscape soil analysis. Acceptable laboratories include Colorado State University Soil, Water and Plant Testing Laboratory, or a comparable certified private laboratory approved by the Owner's Representative.

B. Inspector Access: The Owner's Representative reserves the right to inspect topsoil at the source prior to stripping, at the stockpile, and upon delivery to the project site. Topsoil that does not conform to the requirements of this Section shall be rejected and removed from the site at the Contractor's expense.

C. Rejection: Topsoil that has been contaminated, is excessively wet, or fails to meet the physical or chemical requirements of Part 2 may be rejected at any time, including after placement. Rejected topsoil shall be removed and replaced at no additional cost to the Owner.

D. Contractor Responsibility: The Contractor is responsible for ensuring that all topsoil, whether salvaged or imported, meets the requirements of this Section. The Contractor shall coordinate all soil testing and submittals in sufficient time to obtain Owner's Representative approval before any topsoil is placed.

1.06 SOIL TESTING

A. General: Soil testing is required for all topsoil sources (salvaged on-site topsoil and each imported topsoil source) and for the existing subgrade receiving topsoil. Testing shall be completed and results submitted for Owner's Representative review before topsoil placement begins.

B. Sampling Protocol:
   1. Collect a minimum of three (3) representative composite samples from each topsoil source. For on-site salvaged topsoil, sample before stripping operations begin. For imported topsoil, sample the stockpile or source prior to delivery.
   2. Each composite sample shall consist of soil collected from a minimum of five (5) individual sub-samples randomly distributed across the sampling area, mixed together to form a single composite.
   3. Sample collection depth: 0 to 8 inches for topsoil; 8 to 18 inches for subgrade.

4. Deliver samples to the testing laboratory within 48 hours of collection. Samples shall be submitted in laboratory-approved containers with labels identifying the project name, sample location, date, and Contractor name.

C. Required Tests: Each soil sample shall be analyzed for the following:
1. Particle size distribution (texture): sand, silt, and clay percentages per ASTM D422.
2. Soil pH per ASTM D4972.
3. Organic matter content (percent) per ASTM D2974.
4. Cation exchange capacity (CEC).
5. Macro-nutrient levels: nitrogen (N), phosphorus (P), potassium (K).
6. Micro-nutrient levels: iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B).
7. Soluble salt concentration (electrical conductivity, EC).
8. Sodium adsorption ratio (SAR) or exchangeable sodium percentage (ESP).
9. Heavy metal screen (lead, arsenic, cadmium) if source has a history of industrial use or is located within a previously developed area.

D. Amendment Recommendations: The testing laboratory shall provide written amendment recommendations (type, product, and application rate) to bring topsoil within the specified parameters. The Contractor shall submit these recommendations along with the test reports as specified in Article 1.05.

E. Post-Amendment Testing: If amendments are incorporated based on initial test results, the Owner's Representative may require follow-up soil testing after amendment incorporation and prior to planting operations. The Contractor shall cooperate with and facilitate post-amendment sampling at no additional cost to the Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Notify the Owner's Representative at least 10 days prior to the first topsoil delivery. Deliveries shall not be made without prior notification and approval.

B. Topsoil shall be delivered in a loose, workable condition. Topsoil that is frozen, excessively wet (muddy), or compacted into clods that cannot be readily broken down shall not be accepted.

C. Stockpiles on site shall be located as shown on the approved Stockpile Location Plan and shall be:
1. Protected from erosion with temporary erosion control measures (silt fence, erosion blanket, or equivalent) on all downhill sides.
2. Protected from contamination by runoff, vehicle traffic, and construction debris.
3. Covered with erosion control blanket or seeded with a temporary cover if stockpiled for more than 30 days.
4. Not placed within drainage swales, wetland buffers, or areas of concentrated flow.

D. Do not place topsoil over frozen subgrade or when precipitation is forecast within 24 hours that could cause erosion of freshly placed material.

PART 2 PRODUCTS

2.01 TOPSOIL

A. General: Topsoil shall be fertile, friable, loamy soil capable of supporting vigorous plant growth. It shall be reasonably free of subsoil, stones larger than 3/4 inch in any dimension, roots, sticks, debris, construction waste, toxic materials, and excessive clay or hardpan.

B. Physical Properties: Topsoil shall conform to the following physical requirements:
1. Texture (USDA classification): Sandy loam, loam, silt loam, or clay loam.
2. Sand content: 30% to 60%.
3. Silt content: 20% to 50%.
4. Clay content: 5% to 30%.
5. No hardpan, caliche, or high-clay subsoil layers.

C. Chemical Properties: Topsoil shall conform to the following chemical requirements:

1. pH: 6.0 to 7.5.
2. Organic matter: Minimum 3.0% by weight; 5.0% preferred.
3. Soluble salts (EC): Less than 2.0 dS/m (mmhos/cm).
4. Sodium adsorption ratio (SAR): Less than 6.
5. Phosphorus (P): Minimum 10 ppm (available).
6. Potassium (K): Minimum 100 ppm (available).
7. No known contamination by heavy metals, pesticide residuals, petroleum hydrocarbons, or other toxic substances above regulatory screening levels.

D. Prohibited Content: Topsoil shall not contain:
1. Noxious weeds (seeds, roots, or rhizomes) as listed by the Colorado Department of Agriculture.
2. Invasive plant species or their propagules.
3. Stones larger than 3/4 inch in any dimension exceeding 5% by volume.
4. Construction rubble, concrete, asphalt, glass, or other inorganic debris.
5. Plastic, wire, or other foreign material.

E. Depth of Placement: Topsoil shall be placed and compacted to a minimum finished depth of 4 inches in lawn and groundcover areas and 6 inches in shrub and perennial planting bed areas, or as indicated on the Drawings, whichever is greater.

2.02 SOIL AMENDMENTS

A. All amendments shall be incorporated based on soil test results and laboratory recommendations submitted per Article 1.05. The following amendments are commonly required and shall be used as the basis of design:

B. Organic Amendment: Composted organic material (Cotton Burr Compost, composted wood chips, or approved equal) conforming to U.S. Compost Council (USCC) Seal of Testing Assurance (STA) program standards. Apply at a rate of 3 to 4 CY per 1,000 SF unless otherwise recommended by the soil test. Till to a minimum depth of 4 inches.

C. Starter Fertilizer: Granular, high-phosphorus formulation (16-20-0 or approved equal), applied at the rate recommended by the soil test, incorporated into the topsoil prior to planting.

D. Lime (if pH below 6.0): Agricultural limestone, finely ground, applied at the rate recommended by the testing laboratory to raise pH to the target range. Till into topsoil prior to planting.

E. Sulfur (if pH above 7.5): Elemental sulfur or gypsum (calcium sulfate), applied at the rate recommended by the testing laboratory to lower pH toward the target range. Till into topsoil prior to planting.

F. Trace Element Supplement: As recommended by the soil test, apply a complete micro-nutrient blend at a rate of 100 to 250 pounds per acre and till into the topsoil.

G. All amendments shall be uniformly incorporated into the full depth of the topsoil layer by rototilling or equivalent mechanical means. Amendments shall not be surface-applied without mechanical incorporation unless specifically approved by the Owner's Representative.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subgrade preparation, rough grading, and all underground utility installations are complete and have been accepted by the Owner's Representative before beginning topsoil placement.

B. Do not place topsoil over areas that are excessively wet, frozen, or that contain standing water. Report such conditions to the Owner's Representative and do not proceed until conditions are corrected.

C. Verify that areas receiving topsoil are scarified or otherwise prepared to ensure bonding between the subgrade and the topsoil layer, and to prevent the formation of a distinct interface layer.

3.02 SALVAGE OF ON-SITE TOPSOIL

A. Prior to any grading operations, strip all topsoil from within the construction limits to the depth of the organic horizon (typically 4 to 8 inches) or as directed by the Owner's Representative. Stripping shall be performed before subgrade grading operations disturb the topsoil.

B. Salvaged topsoil shall be stockpiled at approved locations per Article 1.07. Topsoil stockpiles shall be kept separate from subsoil, construction debris, and other fill materials.

C. Salvaged topsoil that does not meet the requirements of Part 2 shall be rejected. The Contractor shall supplement with imported topsoil as required.

D. All excess topsoil after project areas are filled to the specified depth shall remain the property of the Owner and shall be stockpiled at a location designated by the Owner's Representative.

3.03 TOPSOIL PLACEMENT

A. Topsoil shall not be placed until all subgrade work, underground utilities, drainage structures, and irrigation sleeves within the areas to be topsoiled are complete and accepted.

B. Scarify the subgrade to a minimum depth of 2 inches immediately before placing topsoil to promote bonding between the subgrade and topsoil layers.

C. Spread topsoil uniformly to the required depth after settlement, accounting for an estimated 15% compaction factor, or as directed by the Owner's Representative. Do not place topsoil in lifts greater than 8 inches (loose measure).

D. Do not work topsoil when it is excessively wet. Topsoil is too wet to work when a sample squeezed in the hand retains its shape after the hand is opened, or when equipment leaves ruts deeper than 1 inch.

E. Protect placed topsoil from compaction by construction equipment. Use tracked equipment or equipment with low ground pressure in topsoiled areas wherever possible. Avoid unnecessary vehicle traffic over placed topsoil.

3.04 SOIL AMENDMENT INCORPORATION

A. Incorporate all soil amendments specified in Part 2 and required by soil test results into the full depth of the topsoil layer by rototilling or other mechanical means that achieve uniform mixing.

B. Apply amendments uniformly over the topsoil surface at the specified rates using a calibrated mechanical spreader. Verify application rates prior to tilling.

C. After amendment incorporation, till the topsoil to a minimum depth of 4 inches to ensure uniform blending of amendments throughout the topsoil profile.

D. Do not incorporate amendments into topsoil that is too wet or too dry to be properly tilled. Target field moisture content for tillage: soil should be moist but not wet, crumbling freely when worked.

3.05 FINE GRADING

A. After topsoil placement and amendment incorporation, fine grade all areas to the elevations and slopes shown on the Drawings. Fine grading shall be performed by hand rake or light mechanical means as approved by the Owner's Representative.

B. Finished surface shall be smooth and free of visible surface irregularities, depressions, ridges, or undulations greater than 1/2 inch under a 10-foot straightedge.

C. Round all tops and bottoms of slopes smoothly, and provide positive drainage away from structures, walls, and paved surfaces at the grades shown on the Drawings.

D. Fine-graded areas shall be firm enough to support foot traffic without rutting, but not compacted to the point of impeding root penetration.

E. Do not fine grade areas in preparation for seeding or sodding more than 7 days prior to planting operations, to minimize re-establishment of weeds on the prepared surface.

3.06 PROTECTION AND MAINTENANCE

A. Protect all topsoiled areas from erosion, wind, vehicle traffic, and construction activity until planting operations are complete. Install temporary erosion control measures (silt fence, erosion blanket) where topsoiled slopes are exposed for more than 48 hours without vegetative cover.

B. Any topsoiled area that is eroded, contaminated, or otherwise damaged prior to acceptance shall be repaired by the Contractor at no additional cost to the Owner.

C. Maintain topsoiled areas in a condition suitable for planting until planting operations commence.

END OF SECTION 32 91 19

SECTION 32 92 23
SOD

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes the Following Work: This work consists of furnishing all labor, materials, and equipment for spreading and compacting topsoil, preparing the seedbed, and installing Kentucky Bluegrass sod in all areas designated on the Drawings. Work shall result in a fully established, healthy turf cover suitable for the semi-arid, high-altitude climate of southwest Colorado.

B. Related Sections:
   1. Topsoiling 32 91 19.13 Topsoil Placement and Grading
   2. Soil Preparation 32 91 13

1.02 REFERENCE STANDARDS

A. Associated Landscape Contractors of Colorado (ALCC) Guide for Colorado Landscape Industry Contracts, current edition.

B. Turfgrass Producers International (TPI) Guideline Specifications for Turfgrass Sod, current edition.

PART 2 MATERIALS

2.01 NON-SELECTIVE HERBICIDE

A. Prior to sod installation, all existing vegetation and weeds in areas to be sodded shall be eradicated with a non-selective systemic herbicide (glyphosate-based, such as Roundup Pro or approved equal) applied per manufacturer's label instructions and in compliance with all applicable federal, state, and local regulations.

B. Application shall be performed by or under the direct supervision of a licensed commercial pesticide applicator holding a valid Colorado Department of Agriculture (CDA) applicator's license in the appropriate category.

C. A minimum of 14 days shall elapse after herbicide application before sod installation begins, to allow complete desiccation of existing vegetation.

2.02 FERTILIZER

A. A granular starter fertilizer with a high phosphorus formulation (such as 16-20-0, 10-20-10, or approved equal) shall be incorporated into the topsoil prior to sod installation to promote rapid root establishment. Application rate shall be per manufacturer's label recommendations.

B. A follow-up application of a balanced, slow-release granular fertilizer (such as 28-3-8 or approved equal) shall be applied to the sod surface 4 to 6 weeks after installation, once the sod has rooted. Application rate shall be per manufacturer's label.

C. Fertilizer shall be uniform in composition, free-flowing, and suitable for application with a mechanical broadcast spreader. All applications shall be followed immediately by irrigation to water the fertilizer into the soil.

D. Fertilizer shall be applied only when wind speed is less than 7 mph to prevent drift.

2.03 SOD

A. Sod shall be nursery-grown Kentucky Bluegrass (Poa pratensis), consisting of a blend of a minimum of three (3) certified varieties selected for drought tolerance, cold hardiness, and performance at elevations above 6,500 feet. Acceptable varieties for the Ignacio, Colorado area include, but are not limited to: Midnight, Moonlight, Bewitched, Award, or approved equal.

B. Sod shall be 99% weed-free. The allowable 1% weed content shall not include any undesirable perennial or annual grasses or plants classified as noxious weeds by current Colorado Department of Agriculture noxious weed regulations.

C. Sod shall be capable of withstanding moderate to high pedestrian traffic once fully established.

D. Submit proposed sod supplier, variety blend, and a current certified seed analysis for review and approval by the Owner's Representative a minimum of 10 days prior to delivery.

E. The sod shall have a vigorous, healthy root system that has been regularly watered, mowed, and fertilized. Sod shall not exhibit signs of disease, insect damage, or stress.

F. The sod shall be sufficiently mature that it will not tear, break, or crumble during handling and placement. Minimum rooting depth shall be 3/4" and maximum soil thickness shall be 1". Sod shall be cut in uniform strips with minimum dimensions of 18" wide by 48" long, or as rolls.

G. Unless already closely mowed, sod shall be mowed to a height of 1-1/2" to 2" before cutting.

H. Sod in rolls or slabs shall be kept moist and protected from exposure to direct sun, wind, and heat during transport and storage. All sod transported in open vehicles shall be covered.

I. Sod that has been cut more than 24 hours prior to installation shall not be used. Due to the high-altitude, low-humidity conditions typical of southwest Colorado, sod should ideally be installed within 12 hours of cutting during hot weather.

J. Each delivery of sod shall be accompanied by a certificate from the grower stating the species, variety blend, and weed-free certification as required by the Colorado Seed Law.

PART 3 EXECUTION

3.01 REMOVAL OF EXISTING WEEDS AND UNDESIRABLE VEGETATION

A. Apply a non-selective systemic herbicide per Article 2.01 to all areas scheduled to receive sod. Allow a minimum of 14 days for complete kill of all vegetation before proceeding with soil preparation.

B. A second herbicide application may be required if new weed germination occurs after the initial application. Allow an additional 7-day waiting period before sodding following any re-treatment.

C. Mechanical weed removal (raking, tilling) is permitted in conjunction with or as a follow-up to herbicide treatment, subject to approval by the Owner's Representative.

D. No sod shall be installed within 14 days of the most recent herbicide application.

3.02 SOIL PREPARATION

A. All areas to be sodded shall first be topsoiled in accordance with Section 32 91 19.13 – Topsoil Placement and Fine Grading.

B. Topsoil shall be placed and compacted to a minimum finished depth of 4" or as shown on the Drawings.

C. Incorporate a granular soil amendment (composted organic matter or approved equal) tilled to a depth of 4" at a rate of 3 CY per 1,000 SF to improve soil structure and water retention. Given the low annual precipitation and high evapotranspiration rates in the Ignacio area, adequate organic matter content in the soil profile is critical to sod establishment and long-term performance.

D. A soil test shall be performed on the topsoil prior to installation. Results shall be submitted to the Owner's Representative for review. Soil amendments shall be adjusted based on soil test recommendations.

E. Fine grade all areas to a smooth, firm, even surface free of stones, clods, debris, or surface irregularities greater than 1/2". Round tops and bottoms of all slopes and provide positive drainage away from structures.

F. The prepared seedbed shall be firm enough to support foot traffic without rutting, but not so compacted as to impede root penetration.

3.03 SOD INSTALLATION

A. Sod installation is recommended in the spring (May through June) or early fall (mid-August through September) to avoid the peak heat and drought stress of July and August in southwest

Colorado. Summer installation may proceed only with Owner's Representative approval and with enhanced irrigation provisions.

B. No sod shall be laid on frozen soil or when air temperatures exceed 95°F.

C. Lay sod with staggered joints, all edges touching. Butt all edges and ends tightly against each other to eliminate gaps. Do not stretch or overlap sod pieces.

D. Ensure each sod piece has firm, uniform contact with the soil surface. Eliminate all air pockets by hand tamping or rolling.

E. Use a sharp knife to cut sod at borders and irregular edges. Avoid cutting sod into short, narrow strips less than 12" in any dimension.

F. On slopes steeper than 3:1, sod shall be laid parallel to the contours and secured with biodegradable sod staples or wooden stakes at a minimum spacing of 3 per square yard, or as directed by the Owner's Representative.

G. After sod is laid, roll the entire sodded area with a water ballast roller to ensure good sod-to-soil contact and to eliminate air pockets.

3.04 FERTILIZING

A. The Contractor shall notify the Owner's Representative at least 24 hours in advance of any fertilizer application.

B. Apply the starter fertilizer per Article 2.02 by incorporating it into the top 2" of prepared topsoil immediately prior to sod installation.

C. Apply the follow-up slow-release fertilizer per Article 2.02 to the established sod surface 4 to 6 weeks after installation. Irrigate immediately after application.

D. Broadcasting shall not be done when wind speed exceeds 7 mph.

E. Fertilizer shall be applied using a calibrated mechanical broadcast spreader. Care shall be taken to ensure uniform, overlapping coverage at the specified application rate.

3.05 WATERING

A. Immediately after sod is laid, irrigate thoroughly to wet the sod and the top 2" of soil beneath it. Verify soil moisture penetration by pulling back a corner of the sod in several locations.

B. Due to the semi-arid climate, high UV index, and low humidity typical of the Ignacio area, newly installed sod shall be watered two to three times daily during the first two weeks to maintain consistent moisture in the sod and upper soil layer. Do not allow the sod to dry out during the establishment period.

C. After initial establishment (approximately 2 to 3 weeks), reduce irrigation frequency to encourage deep root growth. Target a deep, infrequent watering schedule: 1 to 1-1/2 inches per week applied in two or three applications, adjusted for evapotranspiration.

D. After the sod is moist and firm, roll lightly with a water-ballast roller to eliminate surface irregularities and improve sod-to-soil contact.

E. The Contractor is responsible for coordinating with the irrigation contractor to ensure the automatic irrigation system is fully operational prior to sod installation.

3.06 PROTECTION OF SOD AREA

A. The Contractor shall erect adequate signs, rope barriers, or temporary fencing at all sodded areas to keep foot and vehicle traffic off newly installed sod until it is fully rooted and accepted by the Owner's Representative (typically 4 to 6 weeks after installation).

B. Any damage to sodded areas occurring prior to final acceptance shall be repaired and resodded by the Contractor at no additional cost to the Owner.

C. The Contractor shall maintain all protective signs and barriers as required until final acceptance.

3.07 WARRANTY

A. The Contractor shall guarantee all sodded areas to be in healthy, fully established condition for a period of one (1) full growing season from the date of Substantial Completion. At the end of the warranty period, the turf shall show a minimum of 90% live, healthy grass cover with no bare spots greater than 6" in diameter.

B. The Contractor shall resod or reseed any areas where sod has failed to thrive, as directed by the Owner's Representative, at no additional cost to the Owner.

C. The performance bond shall guarantee sod replacement work during the sod establishment and warranty period.

END OF SECTION 32 92 23

SECTION 32 93 00 PLANTING TREES, SHRUBS, AND GROUNDCOVERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: This Work shall include, but is not limited to, furnishing all necessary materials and workmanship to competently and expeditiously execute the following work: spraying non-selective organic herbicide; fine grading; installing weed barrier and erosion control fabrics; planting trees, shrubs, and groundcovers; fertilizing plants; installation of cedar mulch; and application of organic pre-emergent herbicide.

B. Related Sections:
   1. Section 32 91 19 – Topsoil Placement

1.02 REFERENCE STANDARDS

A. Associated Landscape Contractors of Colorado Guide for Colorado Landscape Industry Contracts and Specifications, current edition.

B. American Standards for Nursery Stock - current edition.

C. Colorado Nursery Act - Title 35, Article 26, Section III, CRS 1973.

PART 2 MATERIALS

2.01 PEAT MOSS

A. Sphagnum peat moss shall be processed to a horticultural grind of uniform texture and be free from extraneous material, and shall have an acidity range of 4.5 - 6.0. It shall be composed of not less than 90% decomposed organic matter, by weight on an ovendried basis.

2.02 PLANT MATERIAL

A. All plants shall be of the size specified or larger, and shall be tagged to identify species. Plants shall be healthy and have normal, well-developed branches and vigorous root systems. Plants shall be free of defects including, but not limited to, harmful insects, diseases, decay, sunscald injury, and major mechanical injuries. Major mechanical injuries include abrasions or damage to the bark or branches to the extent it would affect normal growth and/or appearance or would require pruning or wound treatment. Plants shall not have been in storage for more than 1 growing season. No plant material substitutions shall be allowed without the prior approval of the Owner's Representative. The Contractor shall guarantee all plants to be true to name and type and to meet all contract specifications.

B. All plants shall have been nursery grown unless otherwise specified, under similar climatic conditions as exist in the locality of the project site. The Contractor shall be prepared to supply information pertaining to where plants were grown and the name of the growers as requested by the Owner's Representative. All plants shall have been properly transplanted or root pruned. All plants shall be handled so that roots and foliage are adequately protected at all times from drying out and from other injury. If delivery is made in an open vehicle, the entire load shall be suitably covered, but not so tight as to cause heating. Trees which cannot be planted immediately on delivery shall be well protected with soil or other acceptable mulch material, and shall be moistened periodically to prevent drying. Plants shall be stored in such a way as to assure the effective vigor of the plant.

2.03 FERTILIZER

A. Organic OMRI Certified Fertilizer.

2.04 WEED BARRIER FABRIC

A. 'Typar' #3301 Landscape Fabric, as manufactured by Reemay and supplied by Summit Supply, Durango CO., phone (303) 247-8858, or approved equal. Fabric shall have a minimum weight of 3.0 oz. per sq. yd.

2.05 MULCH

A. Crusherfines gravel ¼" minus.

2.06 COMPOST

A. Cotton Burr Compost, (or approved equal).

2.07 WILDLIFE PROTECTION FENCING

A. All trees to receive wildlife protection fencing. Fence to be 48" high rabbit fencing 2" x 4", 14 gauge galvanized. Wrap fencing around tree 2 times for future adjustment, secure with end of fence wires. Placement of wildlife fencing does not relieve the contractor of responsibility for any damage to trees during the warranty period.

2.08 COBBLES

A. Round washed cobble, 2" Dia. Min., 4" Dia. Max. Submit sample for approval.

2.09 TREE ROOT BARRIER

A. DeepRoot, 18" tree root barrier, UB 18-2, phone (800) 458 7668.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall be responsible for the cost of replacement of any irrigation system components that are damaged as a result of his work. The Owner shall be responsible for subsequent watering provided that the irrigation system is in proper working order. In addition, the Contractor shall be responsible for the daily clean-up necessitated by his operations. This shall include, but is not limited to, the cleaning of sidewalks, stairs, roads, parking lots, and other physical objects if necessary. The Contractor shall be especially careful to avoid the overspray of organic herbicide on adjacent plant material or the staining of sidewalks. The Contractor shall be responsible for any damage caused by his operations. The Contractor shall be responsible for all maintenance, including watering, until the final acceptance of the work by the Owner's Representative.

3.02 MECHANICAL WEED REMOVAL

A. Mechanical weed removal shall be provided that the methods of mechanical weed removal are acceptable to and approved by the Owner's Representative.

3.03 PLANT INSTALLATION

A. Planting shall conform to the planting details shown on the drawings. The Owner's Representative shall approve the plants on site prior to their installation. Plants may be inspected where growing but inspection at place of growing shall not preclude the right of rejection at the site. Any plants determined to be unacceptable by the Owner's Representative shall be replaced at the expense of the Contractor. The Contractor shall notify the Owner's Representative at least 48 hours in advance of planting to allow for plant locations to be staked in the field. In no case shall planting be allowed within 7 days of the spraying of non-selective herbicide. Prior to planting, the Contractor shall grade mulched beds to allow for the addition of 4" depth of mulch without having the mulch higher than the existing surrounding grade. All groundcovers shall be evenly spaced in beds.

B. All plants shall be set plumb in the center of the planting hole. Remove all twine, excess burlap, and wire baskets above the bottom tier of wire prior to backfilling. Install planting tablets as indicated on the drawings. Backfill halfway up the root ball. Place tablet(s) beside the root ball about 1" from root tips. Do not place tablet(s) in bottom of the hole. Complete backfill, tamp and thoroughly water plants immediately after planting. Any injured or broken roots or branches shall be trimmed to a clean, smooth cut. Evergreens shall have only damaged branches trimmed in a manner that the form of the tree is not affected. All plant material labels shall be removed after planting. The Owner's Representative reserves the right to reject any plant improperly pruned, or when the natural character of the plant is compromised, as determined solely by the Owner's Representative.

3.04 WEED BARRIER FABRIC INSTALLATION

A. Weed barrier fabric may be placed prior to or after planting at the Contractor's discretion. The planting area shall be fine graded to eliminate any holes, visible surface undulations, or uneven areas greater than 1", and to provide proper drainage away from structures. All weeds, sticks, stones, and other debris shall be disposed of off-site at the Contractor's expense.

B. Weed barrier fabric shall be unrolled over the entire area and fitted around all existing plants and irrigation. Edges of the fabric shall overlap a minimum of 4". Openings for plants and irrigation shall be kept to the minimum size necessary. Anchor fabric to keep it smooth and even prior to the installation of mulch. Edges should be overlapped and stapled in place. Use staples 2' o.c. at the beginning and end of each piece of fabric. When coming to the end of a roll, overlap the beginning of the next roll by at least 6". The staples should be driven vertically into the ground. Each piece of fabric shall be stapled at each edge and alternately stapled in the center. Staples should be spaced no more than 4' apart down the length of the fabric. Any areas damaged before final acceptance of the work shall be repaired by the Contractor at his expense.

3.05 GRAVEL MULCH INSTALLATION

A. Install gravel mulch evenly over the planting beds to a uniform depth of 4". Do not bury plants, and insure that finished grade of mulch is at same height as surrounding grade. Mulching of all plants shall be completed within 48 hours after planting. Contractor not to install mulch at seeding areas.

3.06 WILDLIFE PROTECTION FENCING

A. Install wildlife protection fencing around any trees. See section 2.8.

3.07 TREE ROOT BARRIER

A. Install tree root barrier at locations as indicated on the planting plans per manufacturer's instructions to prevent tree roots from growing under adjacent pavement areas.

3.08 DATE OF SUBSTANTIAL PROJECT COMPLETION

A. The Owner's Representative will inspect all work upon the written request of the Contractor. The request shall be received at least ten (10) calendar days before the anticipated date of inspection. The warranty period of two growing seasons shall begin at the Date of Project Acceptance. Acceptance of work by the Owner will be for general conformance to the project requirements, and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents. Date of Project Acceptance is when all park improvements are installed (seed, hydromulch, trees, shrubs, etc.) and accepted by the Owner. Acceptance of trees/shrubs/perennials shall be completed at the same time as inspection and acceptance of all seeding, hardscape, playground, and other park improvements.

3.09 PLANT WARRANTY

A. The warranty period for trees and shrubs shall begin at the Date of Acceptance. The Contractor shall guarantee all plant material to be in healthy condition for a period of two growing season from the Date of Acceptance. The growing season is defined as the days between last and first frost, or approximately the last and first occurrence of 32° F (freezing) overnight low temperature. The average growing season for Ignacio is 110 days, approximately late May to early September. As soon as weather conditions allow, and during a suitable planting period, all plants determined by the Owner's Representative to be dead or in an unacceptable condition shall be replaced by the Contractor at his cost. To be considered acceptable, plants shall be free of dead or dying branch tips and shall bear foliage of normal density, size, and color, and shall closely match adjacent specimens of the same species. Replacement plants are subject to all requirements stated in this specification. In the event that a suitable replacement plant is not available, the Owner's Representative may approve a substitution for the specified plant. Placement of wildlife fencing does not relieve the contractor of responsibility for any damage to trees during the warranty period.

B. The Contract performance bond shall guarantee plant replacement work during the landscape establishment and plant warranty period.

END OF SECTION 32 93 00

SECTION 32 93 01
LANDSCAPING & IRRIGATION SYSTEM MAINTENANCE
DURING WARRANTY PERIOD

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all supervision, labor, material, equipment and transportation required to maintain the landscaping and irrigation system for a period of one (1) year after the date of Substantial Completion. Contractor shall provide seasonal start-up and shutdown of the irrigation system.
   1. Mow turf areas (weekly)
   2. Weed control shrub beds – spray/trim/hand pull (bi-weekly)
   3. Trash removal (weekly)
   4. Irrigation system maintenance (start-up, winterization, and as-needed)

1.02 SUBMITTALS

A. The Contractor shall submit a schedule of all maintenance related activities prior to the commencement of work.

B. Maintenance schedule shall include but not be limited to the following:
   1. Irrigation System Maintenance
      a. Winterization procedures
      b. System start-up
      c. Trouble shooting methods
      d. General schedule systems checks
   2. Turf Area Maintenance
      a. Irrigation schedules (coordinate with the Landscape Architect)
      b. Fertilization (winterizer in November, Organic Fertilizer 2-3 times during growing season)
      c. Aeration and thatch removal (once a year)
      d. Mowing (weekly during growing season)
      e. Weed control (apply herbicide as needed, coordinate with Landscape Architect)
      f. Disease and insect control (apply as needed, coordinate with the Landscape Architect)
   3. Woody Plant Maintenance (including groundcover and perennials)
      a. Irrigation equipment and schedules (coordinate with the Landscape Architect)
      b. Re-mulching and soil cultivation (time and materials)
      c. Re-staking, guying, and wrapping
      d. Pruning
      e. Weed control (hand pulling in shrub & perennial beds)
      f. Disease and insect control (apply as needed, coordinate with the Landscape Architect)

C. The Contractor shall submit product data for all maintenance materials such as fertilizers, herbicides, etc. This information shall relate directly to time of use and rate of application.

D. Submit copy of certified commercial pesticide applicator's license.

PART 2 EXECUTION

2.01 MAINTENANCE

A. Maintenance shall be according to the following standards:

B. All areas shall be kept free of debris and all planted areas shall be weeded and cultivated bi-weekly. Watering, mowing, edging, trimming, fertilization, spraying, and pest control, as may be required, shall be included in the maintenance. Street gutters shall be included within the debris/siltation removal program.

C. The Contractor shall re-seed all spots within the lawn where normal turf growth is not evident as determined by the Landscape Architect. All areas not acceptable to the Landscape Architect shall be seeded to match adjacent turf type.

2.02 TREE AND SHRUB CARE

A. Watering: Maintain a large enough water basin around plants so that enough water can be applied to wet the soil throughout the root zone. Maintain a 3" layer of mulch within the basins of all trees. Report all trees and shrubs showing signs of stress to the Owner's Representative.

B. Pruning:
   1. Trees:
      a. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached which have vertical spacing of from 18" to 49" and radial orientation so as not to overlay one another; to eliminate diseased or damaged growth; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain growth within space limitations; to maintain a natural appearance; to balance crown with roots.
      b. Under no circumstances will stripping of lower branches ("raising-up") or young trees be permitted. Lower branches shall be retained in a "tipped-back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk). Lower branches can be cut flush with the trunk only after the tree is able to stand erect without staking or other support. Sucker growth shall be removed if deemed appropriate by the Owner's Authorized Representative.
      c. Evergreen trees shall be thinned out and shaped when necessary to prevent wind and storm damage. The primary pruning of deciduous trees shall be done during the dormant season. Damaged trees or those that constitute health or safety hazards shall be pruned at any time of the year as required to eliminate these conditions.
   2. Shrubs:
      a. The objective of shrub pruning are the same as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the design and directed by the Landscape Architect.
      b. All pruning cuts shall be made to lateral branches or buds or flush with the trunk. "Stubbing" will not be permitted.

C. Staking and Guying: Remove stakes and guys as soon as they are no longer needed, but not later than the end of the maintenance period. Do not allow ties to girdle plant stems.

D. Weed Control: Keep basins and areas between plants free of weeds. Use recommended herbicides with care to prevent damage to plants or other materials.

E. Insect and Disease Control: Maintain a reasonable control with approved materials and methods. Report all infestations and infections to the Owner's Representative before taking control measures.

F. Fertilization:
   1. Fertilize all planting areas as defined in the maintenance schedule.
   2. Avoid applying fertilizer to the root ball and base of main stem; rather, spread it evenly in the root zone.

2.03 GROUNDCOVER CARE

A. Weed Control: Control weeds, with chemical systemic spray or by mechanical means so as to cause minimal damage to planted materials.

B. Watering: Water enough that moisture penetrates throughout root zone and only as frequently as necessary to maintain healthy growth.

C. Fertilizing: Fertilize as specified in maintenance program.

D. Remove trash bi-weekly.

E. Edge groundcover to keep in bounds and trim top growth as necessary to achieve an overall even appearance.

F. Replace dead and missing plants at Owner's expense.

2.04 IRRIGATION SYSTEM

A. Coordinate controller programming with the Landscape Architect.

B. Repair or replacement of irrigation equipment damaged during normal use of irrigation equipment. Any damage to system by contractor’s maintenance crews, i.e., broken heads by mowers, etc., will be repaired by Contractor at Contractor's expense.

C. Operate and visually check all zones of the irrigation system monthly to assure all control valves and heads are operating properly, and that no leaks are visible which may require repair. Open all controller enclosures and visually check condition. Clean as necessary.

D. Trim grass around heads and valve boxes as necessary to ensure proper operation of heads and accessibility to control valve.

E. Work with the Landscape Architect and his consultants to establish proper application rates and scheduling of irrigation system to operation to ensure maximum watering efficiency. Adjust scheduling of system throughout watering season as required to adjust for fluctuations in evapotranspiration rate, (every 30 days - minimum).

F. Contractor shall be responsible for complete winterization of the system in the fall. Winterization of system shall include voiding all lines of water using compressed air or similar method approved by the Landscape Architect. Contractor shall reopen and start up system in the spring and make any adjustments to system as necessary for proper operation. Should it become necessary to irrigate during the winter months as a result of a lack of natural precipitation and moderate temperatures, the Contractor shall take whatever measures are required to provide required water to all plantings and turf. If it is decided by Contractor to activate irrigation system at any time during the winter months, he shall also be required to, again, properly winterize system.

END OF SECTION 32 93 01

SECTION 33 01 10.58
DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of site domestic water lines specified in Section 33 14 16.

B. Disinfection of building domestic water piping specified in Section 22 10 05.

C. Testing and reporting results.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Disinfection of building domestic water piping system.

B. Section 33 14 16 - Site Water Utility Distribution Piping.

C. All testing of the public water system shall be coordinated with the Southern Ute Utilities Division

1.03 REFERENCE STANDARDS

A. Southern Ute Utilities Division Technical Specifications and IHS Standard Specifications and Details.

B. AWWA B300 - Hypochlorites; 2024.

C. AWWA B301 - Liquid Chlorine; 2024.

D. AWWA B302 - Ammonium Sulfate; 2023.

E. AWWA B303 - Sodium Chlorite; 2024.

F. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate results comparative to specified requirements.

C. Certificate: From Southern Ute Utilities Division and/or Colorado Department of Public Health and Environment (CDPHE), as appropriate, indicating approval of water system.

D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

E. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.

F. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water complies, or fails to comply, with bacterial standards of CDPHE.

1.05 QUALITY ASSURANCE

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State in which the Project is located.

C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, and AWWA B303 Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that the piping system has been cleaned, inspected, and pressure tested as appropriate.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

A. Introduce calcium hypochlorite treatment into the piping system slowly, at a velocity of less than 1 ft/s, to achieve an initial chlorine residual of at least 25 mg/L.

B. Maintain the disinfectant in the system for a minimum of 24 hours if the water temperature is above 41°F, or 48 hours if the water temperature is below 41°F.

C. The Contractor shall mark all valves isolating the new water main from the existing active utility network to prevent the unintended release of elevated chlorine or untested water.

D. Pressure test the system in accordance with IHS Section 04, TP-410 (Hydrostatic Tests) and the requirements of the Southern Ute Utilities Division.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Test samples in accordance with AWWA C651, or as otherwise approved by Southern Ute Utilities Division and/or CDPHE.

END OF SECTION

SECTION 33 14 16
SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water pipe for site conveyance lines.

B. Pipe valves.

C. Fire hydrants.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

B. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

1.03 REFERENCE STANDARDS

A. Southern Ute Utilities Division and the IHS Standard Specifications and Details.

B. AASHTO HB - Standard Specifications for Highway Bridges; 2005, with Errata.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

D. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

G. ASME B18.2.2 - Nuts for General Applications: Machine Screw Nuts; and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series); 2022.

H. ASME B18.5.2.1M - Metric Round Head Short Square Neck Bolts; 2006 (Reaffirmed 2011).

I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

J. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

K. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

M. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

N. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2021.

O. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2020.

P. 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.

Q. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2022.

R. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 2019.

S. ASTM F1807 - Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Cross-Linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing; 2026.

T. 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; 2024.

U. ASTM F2080 - Standard Specification for Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe and SDR9 Polyethylene of Raised Temperature (PE-RT) Pipe; 2023.

V. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

W. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

X. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges; 2020.

Y. AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger; 2017.

Z. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe; 2020.

AA. AWWA C205 - Cement–Mortar Protective Lining and Coating for Steel Water Pipe—4 In. (100 mm) and Larger—Shop Applied; 2018.

BB. AWWA C206 - Field Welding of Steel Water Pipe; 2017.

CC. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 in. through 144 in. (100 mm through 3600 mm); 2018.

DD. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings; 2017.

EE. AWWA C209 - Tape Coatings for Steel Water Pipe and Fittings; 2019.

FF. AWWA C210 - Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings; 2015, with Addendum (2020).

GG. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; 2019.

HH. AWWA C502 - Dry-Barrel Fire Hydrants; 2018.

II. AWWA C504 - Rubber-Seated Butterfly Valves; 2015.

JJ. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1,200-mm) NPS; 2017.

KK. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2015.

LL. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances; 2017.

MM. AWWA C602 - Cement-Mortar Lining of Water Pipelines in Place - 4 In. (100 mm) and Larger; 2017.

NN. AWWA C606 - Grooved and Shouldered Joints; 2015.

OO. AWWA C800 - Underground Service Line Valves and Fittings; 2021.

PP. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm); 2016, with Errata (2018).

QQ. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Service; 2020.

RR. AWWA C904 - Cross-Linked Polyethylene (PEX) Pressure Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service; 2016.

SS. AWWA M11 - Steel Pipe - A Guide for Design and Installation; 2016, with Addendum (2019).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Southern Ute Utilities Division (SUUD) and IHS Standard Specifications.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

B. Protect crosslinked polyethylene tubing from direct and indirect UV exposure.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for materials incorporated in the project.

PART 2 PRODUCTS

2.01 PIPE, APPURTENANCES AND BEDDING

A. Pipe, appurtenances and bedding shall be provided as indicated on the drawings, and in accordance with the PAWSD Technical Specifications.

PART 3 EXECUTION

3.01 EXAMINATION, PREPARATION, TRENCHING AND INSTALLATION

A. Pipe, appurtenances, and bedding shall be provided as indicated on the drawings and in accordance with IHS Standard Specifications (Section 04) and Southern Ute Utilities Division standards.

B. PVC Pipe (4-12 inches): Shall conform to ANSI/AWWA C900, DR18 Class 235 (minimum) with gaskets meeting ASTM F477 and joints in compliance with ASTM D3139.

C. PVC Pipe (2-inch): Shall be SDR 21 (200 psi) conforming to ASTM D-2241.

D. Tracer Wire: 10-gauge single strand copper THHN/THWN polyethylene insulated tracing wire. Securely attach to the top of the pipe at least three (3) times per pipe length and ground at all valve boxes and hydrants.

E. Warning Tape: Blue in color, minimum 3 inches wide, 5 mils thickness, with a metal foil core (or plastic without metal foil where copper tracer wire is installed).

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Hydrostatic Testing: Pressure test water piping in accordance with IHS Section 04, TP-410. The test pressure shall be 1.5 times the maximum working pressure, or a minimum of 150 psi.

C. Test duration shall be a minimum of 2 hours using two gauges simultaneously (5 psi maximum graduations).

D. Pipe must be filled with water for at least 24 hours prior to testing.

E. Air testing is strictly prohibited.

END OF SECTION

SECTION 33 31 13
SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

1.02 RELATED REQUIREMENTS

A. Southern Ute Utilities Division and the IHS Standard Specifications and Details.

B. Section 31 23 16 - Excavation: Excavating of trenches.

C. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

D. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. Technical standards and regulations of the Southern Ute Indian Tribe's utility authority.

B. IHS Standard Specifications and Details (specifically Section 06 - Gravity Sanitary Sewers and April 2021 Section 7 - Sewer Service Lines).

C. ASTM D3034 - Standard Specification for Type PSM PVC Sewer Pipe and Fittings.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of sewer with size, location, and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

D. Scheduling: Connection of the pressure sewer service shall be coordinated with Harman Park Subdivision.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

E. Field Quality Control Submittals: Document results of field quality control testing.

F. Project Record Documents:
   1. Record location of pipe runs, connections, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 PIPE, APPURTENANCES AND BEDDING

A. PVC Gravity Sewer Pipe (4-15 inches): Conforming to ASTM D3034, SDR-35 with integral bell and spigot joints meeting ASTM D3212 and rubber gaskets meeting ASTM F477.

B. Sewer Service Lines: Conforming to ASTM D3034, SDR-35 with integral bell and spigot joints meeting ASTM D3212.

C. Warning Tape: Green in color with 'Caution - Buried Sewer Line Below' continuously printed, minimum 3 inches wide, 5 mils thick, with an 18-inch maximum bury depth.

D. Sewer Main Connection (April 2021 Section 7 Specification): Sewer service line connections to the sewer main shall be made using Romac 'CB' or equal sewer saddles. Sewer wyes shall be PVC. Stainless steel wye type saddles shall not be permitted..

PART 3 EXECUTION

3.01 GRADE AND ALIGNMENT

A. Lay pipe upgrade with spigots pointing in the direction of flow. Sewer service lines must maintain a uniform grade of not less than 2 percent. Changes in direction of sewer service lines shall be restricted to bends of 45 degrees or less (IHS Section 07, TP-702).

3.02 SEPARATION FROM WATER LINES (IHS SECTION 06, TP-606)

A. Maintain a minimum 10-foot horizontal separation in separate trenches. Where crossing, maintain a minimum 18-inch vertical clearance with the water line positioned above the sewer line.

B. Special Crossing Protection: Where vertical clearance is less than 18 inches, the sewer line shall be reconstructed of Class 350 cement-mortar lined ductile iron pipe for 10 feet on either side of the crossing point.

C. Sewer mains or service lines shall not pass through, under, or contact any part of a water or sewer manhole.

3.03 FIELD QUALITY CONTROL TESTING (IHS SECTION 06, TP-610)

A. Alignment Testing: Verify sewer main alignment by shining a light between manholes. Maximum horizontal alignment deviation of 1/4 of the pipe's inside diameter may be accepted.

B. Deflection Testing: Perform deflection testing on all PVC gravity sewer lines between manholes using a go-no-go mandrel or deflectometer. Vertical deflection must not exceed 5 percent.

C. Leakage and Watertightness Testing:

1. Infiltration/Exfiltration: Leakage must not exceed 10 gallons per day per inch diameter per 1,000 feet of sewer over a minimum 4-hour period.

2. Low-Pressure Air Test: Pressurize the line to 5.0 psig and allow it to stabilize for 5 minutes. The pressure must not drop more than 1.0 psig over the required test duration (1.2 minutes per 100 feet for 8-inch pipe, 1.5 minutes for 10-inch pipe, and 1.8 minutes for 12-inch pipe).

D. Manhole Watertightness: All precast concrete manholes must be tested prior to backfilling using Vacuum Testing in accordance with ASTM C1244 (holding a 10-inch Hg vacuum for at least 60 seconds for a 48-inch manhole, 75 seconds for a 60-inch manhole, or 90 seconds for a 72-inch manhole with a maximum drop of 1 inch Hg) or Hydrostatic Testing in accordance with ASTM C969.

E. Flushing: Thoroughly flush all gravity lines with domestic quality water to remove debris and silt prior to pre-final inspection.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES - SLOT DRAIN & DOWNSPOUT TRANSITION ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
1. Pre-engineered stainless steel slot drain channel systems embedded in concrete patio slabs.
2. Inline downspout catch basin assemblies with integrated sediment baskets and tamper-resistant covers.
3. Outlet connections, pipe fittings, and elastomeric joinery to underground storm piping.

1.2 REFERENCES
A. ASME A112.6.3 - Floor and Trench Drains.
B. ASTM A240/A240M - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications (Type 304/316).
C. ASTM C478 - Precast Reinforced Concrete Manhole Sections and Catch Basins (where applicable).
D. Americans with Disabilities Act (ADA) Standards for Accessible Design, Section 302 (Floor and Ground Surfaces - Heel-Proof Openings).

1.3 SUBMITTALS
A. Product Data: Manufacturer's technical specification sheets, hydraulic flow capacity charts, and installation instructions for slot drain channel bodies, downspout basins, and fittings.
B. Shop Drawings: Layout plans, elevations, section details, slope profiles, concrete encasement details, and junction points with downspouts and discharge piping.
C. Maintenance Data: Manufacturer cleaning guidelines, including sediment basket retrieval and channel flushing protocols.

1.4 QUALITY ASSURANCE
A. Manufacturer Qualifications: Minimum 5 years experience manufacturing linear drainage systems.
B. Single-Source Responsibility: Slot channels, transition basins, outlets, and cleanout accessories shall be supplied by a single manufacturer.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION
A. Linear slot drain assembly shall consist of a pre-sloped, continuous slot channel body installed flush with adjacent finished concrete slab surfaces.
B. System shall feature child-safe, heel-proof openings and tamper-resistant hardware to prevent debris insertion and unauthorized access.

2.2 PERFORMANCE REQUIREMENTS
A. Intake Capacity: Minimum 10.0 GPM per linear foot of slot run.
B. Load Classification: Minimum DIN/EN Load Class C (56,200 lbs/ft) suitable for pedestrian and light utility vehicular traffic.
C. Hydraulics: System designed to handle site design rainfall intensity of 2.0 in/hr (100-year storm event for La Plata County / Ignacio, CO).

2.3 MANUFACTURERS & BASIS OF DESIGN
A. Basis-of-Design Product: Landscape Drains / Slot Drain Systems - 6000 Series Slot Drain.
B. Acceptable Alternates:
1. ACO Polymer Products - KlassikDrain KS100 with Stainless Steel Brickslot Top.
2. Infinity Drain - FXAS Series Stainless Linear Drain.

2.4 MATERIALS & COMPONENTS

A. Slot Drain Channel Body:

1. Material: AISI Type 304 Stainless Steel (Type 316 for enhanced chemical resistance).
2. Slot Width: Maximum 5/16 in. to 1/2 in. (ADA compliant / Heel-Proof).
3. Internal Slope: Built-in continuous 0.5% internal invert slope.
4. Section Lengths: Standard 9 ft 8 in. sections with factory-mating alignment flanges.

B. Inline Downspout Catch Basin Assembly:

1. Enclosure: Type 304 Stainless Steel basin, minimum nominal dimensions 8 in. W x 8 in. L x 12 in. D, designed to mate directly with the slot channel inlet profile.
2. Top Cover: Tamper-resistant Type 304 Stainless Steel cover plate with factory cut-out matched to receiving downspout size (2x3 in. or 3x4 in.). Fastened with tamper-resistant 316 Stainless Steel Torx screws.
3. Internal Sediment Basket: Removable Type 304 Stainless Steel mesh basket (1/8 in. max perforations) with internal overflow bypass weir and collapsible wire lifting handle.

C. Pipe Connections & Outlets:

1. Outlets: Bottom or end discharge spigots, Schedule 40 PVC or stainless steel, 3 in. or 4 in. nominal diameter.

PART 3 - EXECUTION

3.1 EXAMINATION & PREPARATION

A. Verify subgrade compaction (minimum 95% Standard Proctor) and elevations prior to setting channel bodies.

B. Verify downspout drop locations align precisely with planned catch basin transition points.

3.2 INSTALLATION

A. Channel Setting & Suspension:

1. Suspend slot drain channels and downspout basins over prepared aggregate base using manufacturer rebar tie-down clips and leveling feet.
2. Align top of slot neck to sit exactly 1/8 in. below final finished elevation of adjacent concrete patio slab to ensure positive drainage entry.

B. Joint Sealing:

1. Seal all channel-to-channel and channel-to-basin mechanical joints using a high-performance elastomeric polyurethane sealant (Sikaflex-1A or approved equal).

C. Concrete Encapsulation:

1. Encase slot drain body and basin in a monolithic 4,000 PSI fiber-reinforced concrete envelope, extending a minimum of 4 in. beneath and 4 in. laterally along all channel sides.
2. Install temporary slot protective covers or foam inserts prior to pour to prevent concrete slurry intrusion into channel throat.

3.3 CLEANING & PROTECTION

A. After concrete curing, remove protective slot covers and clear any construction debris from channel and basin.

B. Insert sediment basket into downspout basin and verify secure fit of tamper-proof cover plates.

C. Flush complete system with water to verify unimpeded gravity flow to discharge point.

END OF SECTION