

Project Manual

Bidding Documents

**OUTPATIENT ONCOLOGY CLINIC
KONA COMMUNITY HOSPITAL**
Haukapila Street
Kealahou, Hawaii

KYA Inc.
Project No. 23043.00
April 05, 2024



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DIVISION 00

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 0 – PROCUREMENT & CONTRACTING REQUIREMENTS

SECTION 00400 – BID PROPOSAL FORM

Hawaii Health Systems Corporation
Kona Community Hospital (Owner)
79-1019 Haukapila Street
Kealahou, Hawai'i 96750

Attn: Yvonne S. Taylor, Senior Contracts Manager, ytaylor@hhsc.org

RE: RFP 24-0005 Outpatient Oncology Services Clinic

Dear Yvonne:

The undersigned has carefully examined the attached plans and specifications marked "KONA COMMUNITY HOSPITAL, OUTPATIENT ONCOLOGY SERVICES CLINIC" and hereby proposes to furnish at his/her own expense all labor, materials, tools, and equipment necessary to construct in place complete, all the work and construction as shown and called for, all in accordance with the true intent and meaning of the plans and specifications, general conditions, contract and bonds, as follows:

BASE BID - LUMP SUM PRICING

All work and construction as shown and called for to complete the Work for the lump sum of {all taxes shall be included in the lump sum amount(s)}:

	PHASE 1: ROC Reno	PHASE 2: Infusion Clinic
1. Division 1: General Requirements	\$ _____	\$ _____
2. Division 2: Site Work	\$ _____	\$ _____
3. Division 3: Concrete	\$ _____	\$ _____
4. Division 5: Metals	\$ _____	\$ _____
5. Division 6: Wood and Plastics	\$ _____	\$ _____
6. Division 7: Thermal and Moisture Protection	\$ _____	\$ _____
7. Division 8: Doors and Windows	\$ _____	\$ _____
8. Division 9: Finishes	\$ _____	\$ _____
9. Division 10: Specialties	\$ _____	\$ _____

10.	Division 13: Special Construction	\$ _____	\$ _____
11.	Division 15: Mechanical	\$ _____	\$ _____
12.	Division 16: Electrical	\$ _____	\$ _____
	SUBTOTALS (Items 1 – 12)	\$ _____	\$ _____

COMBINED BASE BID LUMP SUM SUBTOTAL: \$ _____

VARIABLE QUANTITIES UNIT PRICES (VQUP)

(See Section 01270 for detailed explanation)

Item No.	Description	Quantity	Unit	Unit Price	Subtotal Cost
1.	Firestopping	360	LF	\$ _____	\$ _____

VQUP SUBTOTAL: \$ _____

TOTAL LUMP SUM BASE BID:

(BASE BID LUMP SUM SUBTOTAL+VQUP SUBTOTAL): \$ _____

Total in Words

ALTERNATE NO. 1

Falkbuilt Partitions
(See Section 10 22 00)

**PHASE 2:
Infusion Clinic**

1.	Division 1: General Requirements	\$ _____
2.	Division 2: Site Work	\$ _____
3.	Division 3: Concrete	\$ _____
4.	Division 5: Metals	\$ _____
5.	Division 6: Wood and Plastics	\$ _____
6.	Division 7: Thermal and Moisture Protection	\$ _____
7.	Division 8: Doors and Windows	\$ _____

8.	Division 9: Finishes	\$ _____
9.	Division 10: Specialties	\$ _____
10.	Division 13: Special Construction	\$ _____
11.	Division 15: Mechanical	\$ _____
12.	Division 16: Electrical	\$ _____
	SUBTOTALS (Items 1 – 12)	\$ _____

TOTAL LUMP SUM ALTERNATE NO. 1 SUBTOTAL:
 (ALTERNATE NO. 1 SUBTOTAL+BASE BID PHASE 1:
 ROC SUBTOTAL+VQUP SUBTOTAL):

\$ _____

Total in Words

The Contractor further agrees to complete the work as noted under the TOTAL LUMP SUM BASE BID above on or before the scheduled date and/or time frame as noted in the Request for Proposals (Competitive Sealed Proposals).

It is understood that the award of contract will be made as noted in the Request for Proposals.

It is understood and agreed that the Owner reserves the right to reject any and/or all bids and waive any defect when, in his/her opinion, such rejection or waiver will be for the best interest of the Owner.

The undersigned hereby agrees that the award of this Contract shall be conditioned upon funds being made available for this project and further upon the right of the Owner to **hold all bids received for a period of ninety (90) days of the opening thereof, during which time no bid may be withdrawn.**

Upon acceptance of the proposal by the Owner, the undersigned hereby agrees to enter into and execute a contract for the same.

The Contractor shall acknowledge receipt of any and all addenda issued by the Architect by recording the date of receipt of the respective addenda in the space provided as follows:

ADDENDUM NO. 1	_____	ADDENDUM NO. 2	_____
ADDENDUM NO. 3	_____	ADDENDUM NO. 4	_____
ADDENDUM NO. 5	_____	ADDENDUM NO. 6	_____

It is understood that failure to receive any such addenda shall not relieve the Bidder from any obligation under this Proposal as submitted.

Submit your bid proposal as noted in the Request for Proposals.

Enclosed are:

1. Current (within the last 30 days) Certificate of Vendor Compliance.
2. Current (within the last 30 days) Certificate of Good Standing.
3. Evidence of the authority of the signing officer to submit bids on behalf of the Company.
4. KCH Require Documentation/Compliance Documents:
 - W-9
 - Vendor Terms and Conditions (If any)
 - Confidentiality Agreement (Exhibit H)
 - General Excise License (Copy)
 - General Contractor License (Copy)
 - Any Other Applicable License (Copy)
 - Letter from Surety Committing to Provide the Required Bonds

(CORPORATE SEAL)

Respectfully submitted,

Name of Company

By _____
Signature

Title _____

Contractor's License _____

RME: _____

Federal ID: _____

G.E.T License _____

Date: _____

Address: _____

Telephone: _____

SUBSTITUTION REQUEST FORM

SUBSTITUTION REQUESTS WILL BE
CONSIDERED NO LATER THAN 10 DAYS
PRIOR TO BID SUBMITTAL

TO: KYA Inc.

SECTION NUMBER: _____ PARAGRAPH: _____

SPECIFIED ITEM: _____

PROPOSED SUBSTITUTE: _____

Attach description, designation, catalog number, data sheets, other technical data, laboratory tests and samples as applicable for evaluation of proposed substitution. List features which are at variance with bidding document requirements. See page 3 for instructions.

If there is an engineered substitution, submit the engineered calculations and certification(s) that they have met or exceeded the contract requirements. Failure to provide this information may result in a rejection of the substitution request.

State below why substitution should be considered for this project and indicate in detail how substitution will affect guarantees, other trades, products, dimensions, etc. Attach additional pages as required to describe any change to project. Use of acceptable substitutions is subject to the requirements of Section 01600 – Product Requirements.

SUBMITTED BY: _____
(Firm Name)

(Address, City, State, Zip Code)

(Telephone) (Name) (Signature) (Date)



ARCHITECT'S REVIEW/COMMENTS

Remarks:

- Accepted
- Accepted as noted
- Not accepted
- Received too late

BY: _____

INSTRUCTIONS FOR SUBMITTING SUBSTITUTION

1. Submit a separate substitution request for each type of product or equipment.
2. For substitution requests which include a number of individual related items, such as hardware, paint, fixtures, etc., submit one request for the broad category of related items.

Attach a summary sheet listing each individual item covered by the request, the item specified and its proposed substitution.

Identify the accompanying supporting data for each item by the letter or numeral designation used on the summary sheet.

3. Submit substitution requests with attached supporting data as follows:
Four (4) copies for products relating to Structural, Mechanical or Electrical.
Three (3) copies for other products.
4. Mark the words "Substitution Request" conspicuously on the outside of the envelope when submitting the request.
5. Substitution Requests submitted by other than the General Contractor will not be considered.
6. Substitution Requests not submitted on a copy of this form will not be considered.
7. Substitution Requests submitted by facsimile machine will not be accepted nor responded to.

END OF SECTION

DIVISION 01

GENERAL REQUIREMENTS

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01100 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Contract description.
- B. Contract use of premises.
- C. WEST HAWAII FACILITIES DIRECTOR (WHFD) AND/OR PROJECT MANAGER furnished/WHFD AND/OR PROJECT MANAGER installed products.
- D. WHFD AND/OR PROJECT MANAGER furnished/contractor installed products.
- E. Hospital occupancy.

1.02 RELATED SECTIONS

- A. Section 01260 – Contract Considerations.
- B. Section 01732 – Cutting and Patching.

1.03 CONTRACT DESCRIPTION

- A. The project involves two primary areas of work on the Kona Community Hospital campus: (1) Renovation of the Regional Oncology Center (ROC) to accommodate the relocation of Medical Oncology Services from the Cancer Center Building (CCB) and (2) Renovation of a ground floor space, old records storage, in the Special Services Building (SSB) to house the new expanded Infusion Services Clinic. Also included is the addition of a sink in the Admin Storage/Breakroom on the 1st floor of the SSB.
- B. The Work of the contract generally includes, but is not limited to the following:
 - 1. Phase 1: Renovation of a portion of ROC for current occupants, Radiation Oncology Services, to share space with Medical Oncology Services:
 - a. Selective demolition of interior and exterior components.
 - b. Saw cutting, trenching, and patching concrete floors.
 - c. Alteration of associated HVAC, electrical, communications, lighting, plumbing and fire sprinkler systems.

- d. Adding a small exterior window to the old record storage closet.
 - e. Preparing existing office spaces to receive new modular furniture, OFOI.
 - f. Renovation of reception and waiting area to include two reception desks and additional workstations.
 - g. New partitions, doors, acoustical ceiling tiles, gypsum board ceiling, flooring, wall protection, paint, lighting, AC supply/registers, fire sprinklers, plumbing stub outs, and electrical work.
 - h. Firestopping all new and/or existing penetrations through fire rated walls.
2. Phase 2: Renovation of a portion of the SSB ground floor for new expanded Infusion Services Clinic (old Record Storage):
- a. Selective demolition of interior and exterior components.
 - b. Saw cutting, trenching, and patching concrete floors.
 - c. New HVAC, electrical, communications, lighting, and plumbing systems connected to existing utilities.
 - d. Firestopping all new and/or existing penetrations through fire rated walls.
 - e. New partitions, furred walls, doors, casework, countertops, acoustical ceiling tiles, gypsum board ceilings, flooring, wall protection, paint, lighting, select restroom accessories, AC supply/registers, plumbing fixtures, and electrical work.
 - f. Selective demolition in adjacent spaces interior affected by HVAC and plumbing work.
 - g. Relocation of select existing plumbing pipes, serving the floor above the project area, to accommodate required new ceiling height.
 - h. Verification if new ceiling height design requires the replacement of existing mech room and existing restroom exhaust fans with portion of ductwork.

1.02 CONTRACTOR USE OF PREMISES

- A. Limit the use of premises to allow for continued Hospital occupancy.
- B. Emergency Building Exits During Construction: Must remain open and unblocked at all times. Maintain access for staff, patients, and public. Egress must be maintained and way finding signage during construction.
- C. Construction Operations: Limited to areas noted on Drawings.
- D. Staging and Parking
 - 1. Staging area and limited contractor employee parking will be made available on site. Contractor and vendor parking is designated. Any new parking arrangements require prior approval by the WHFD AND/OR PROJECT MANAGER.
- E. Time Restrictions for Performing Work:
 - 1. See Request for Proposal and coordinate w/ WHFD AND/OR PROJECT MANAGER. Submit written notice a minimum three days in advance to confirm working hours. Any work performed outside of the normal working hours shall be pre-approved by the WHFD and/or Project Manager.
- F. Cooperate with Hospital to minimize conflict and to facilitate Hospital's operations. Coordinate operations with WHFD AND/OR PROJECT MANAGER.
- G. Access to adjacent floors must be approved in advance by the WHFD AND/OR PROJECT MANAGER. Submit written notice not less than seven days in advance of intended work on adjacent floors.
- H. Do not close or obstruct roadways without first consulting with the WHFD AND/OR PROJECT MANAGER. Conduct operations with minimum interference to public or private roadways.
- I. Maintain vital services (as defined by the WHFD AND/OR PROJECT MANAGER) with the minimum of interruption. Outages and interruptions must be

approved in advance by the WHFD AND/OR PROJECT MANAGER. Submit written notices of outages and interruptions not less than seven days in advance.

J. Contractor's personnel:

1. It is preferred that contractors park in gravel lot adjacent to Hospital.
2. Contractor's personnel may use the hospital cafeteria.
3. Contractor's personnel may use the hospital's restrooms.
4. Smoking is not permitted anywhere on KCH property. Consumption of food and beverages will not be permitted on the premises except in designated areas.
5. Playing of radios will not be permitted.
6. Shall be properly attired for work. (No tank tops, cut-off jeans, slippers, etc.)
7. Shall conduct themselves with decorum and courtesy toward staff, patients, and public.
8. Shall not use loud and offensive language.
9. Shall read and sign the KCH Contractor's Guidelines Handbook.

K. Construction Zone Accessibility Requirements

1. General: Hawaii Revised Statutes (HRS) 103-05 requires this project to conform to the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG).
2. Ensure accessible routes to emergency entrances and exits to and from accessible parking public pedestrian routes during the construction period as required by ADAAG 4.1.1(4).
3. Temporary buildings and facilities that are not of permanent construction but are extensively used or are essential for public use for a period of time shall be accessible. Egress must be maintained and way finding signage during construction.
4. Provide temporary safe pedestrian passageway around a construction site.
 - a. Areas that are used only as work areas shall be designed and constructed so that individuals with disabilities can approach, enter, and exit the areas.

- b. These guidelines do not require that any areas used only as work areas be constructed to permit maneuvering within the work area or be constructed or equipped (i.e., with racks or shelves) to be accessible.
- c. Follow OSHA guidelines concerning scaffolding and debris and dust protection.

1.03 WHFD AND/OR PROJECT MANAGER FURNISHED/WHFD AND/OR PROJECT MANAGER INSTALLED PRODUCTS

- A. Items noted "OFOI" (WHFD AND/OR PROJECT MANAGER Furnished/WHFD AND/OR PROJECT MANAGER Installed) will be furnished and installed by the WHFD AND/OR PROJECT MANAGER, including but not limited to:
 - 1. Select medical equipment as noted on the drawings.
 - 2. Select toilet accessories as noted on the drawings.
 - 3. Movable furniture.
- B. Hospital's Responsibilities:
 - 1. Return Hospital reviewed shop drawings, product, data and samples, to Contractor.
 - 2. If requested by the Contractor, assist the Contractor with inspection of select equipment and/or accessories prior to installation.
- C. Contractor's Responsibilities:
 - 1. Review WHFD AND/OR PROJECT MANAGER's provided shop drawings, product data, and samples.
 - 2. Provide any necessary utility roughs and backing, and install in accordance with manufacturer's instructions.
 - 3. Arrange and pay for product delivery to site.
 - 4. Submit claims for transportation damage and replace damaged, defective or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections and service.

1.04 HOSPITAL OCCUPANCY

- A. The Hospital will remain operational during the entire period of construction for the conduct of normal operations.
- B. The Contractor is to coordinate the work and details within each phase, to minimize disruption to WHFD AND/OR PROJECT MANAGER's operation. Advanced notification of a minimum of one week for disruption due to noise and other construction activity is required as well as posting of signage in advance to advise occupants of such disruption.
- C. Provide dust and noise barriers where specified under other portions of the contract documents. Follow ICRA procedures during construction, i.e., Policy #125-54 as attached. Walk off mats at site entrance shall be changed as needed. HEPA filtration units are to be utilized 24 hours per day throughout the construction process.
- D. Schedule the Work, and cooperate with Hospital to minimize conflict with work involving dust and noise and odor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



Title: INFECTION CONTROL DURING CONSTRUCTION AND RENOVATION	Reference #: 449 Version: 2
Owner: Lisa Downing (RN)	Date Approved: 07/12/2019 Last Review Date: 07/12/2019

PURPOSE:

This policy will outline infection control measures that will be implemented during all phases of renovation or construction that takes place at Kona Community Hospital. This will require that an infection control risk assessment be conducted when planning projects that involve demolition, construction, or renovation. The purpose of the assessment is to avoid compromising patient care due to construction activities in occupied areas of the hospital's buildings. Appropriate controls will be implemented based on the results of the risk assessment to provide an environment that is safe from environmental hazards for patients, visitors, contract workers, employees and physicians. These infection control measures will also be observed during any maintenance activities that would fall under repairs or renovation in sensitive areas.

POLICY:

The Environment of Care and Infection Control committees will manage the policy. The Environment of Care and the Infection Control Practitioner will review all construction or renovation projects in the planning phases and throughout the project. This will include and not be limited to:

1. Design, number and type of isolation rooms.
2. Heating, ventilation, and air conditioning systems (HVAC)
3. Mechanical system involving water supply and plumbing.
4. Number, type and placement of handwashing fixtures
5. Sharps disposal unit placement
6. Accommodation for personal protection equipment
7. Surfaces: ceiling tiles, walls, flooring coverings and furnishings
8. Utility rooms: soiled, clean, instrument processing, workrooms.

Maintenance Department, Engineer, and Facility Manager will keep the Environment of Care Committee and the Infection Control Department informed of all locations of renovation and construction. An Infection Control Risk Assessment (ICRA) will be completed prior to any construction, repairs or renovations. **Infection Control Construction Permit is required for all class III or IV construction and risk categorization.** The Facility Manager, Engineer or Infection Control Department will monitor the construction daily while work is being performed or as needed and complete the Construction Compliance Survey form. All construction workers, including subcontractors, are to follow the infection control procedures described in this policy.

RESPONSIBILITIES:

A multidisciplinary group will be formed to evaluate infection control risk, beginning with the planning phase of construction or renovation project. The Construction/Facility Manager is to ensure that the **ICRA (Infection Control Risk Assessment)** (see Appendix 1) and the policy are written into the construction contract document. The construction contractor is obligated to perform specific requirements that are in the contract during the construction process. The multidisciplinary team will consist of at a minimum the Facilities Director (or designee), Construction Supervisor and the Infection Prevention Director. Expertise not provided by the core membership should be brought in whenever the complexity of the project requires it (see following table).



TEAM MEMBERS	FUNCTIONS AND RESPONSIBILITIES
Infection Control Coordinator and committee	Coordinate member's input in developing a comprehensive project management plan. Review and sign a permit for any construction or renovation that is in the highest risk group or Class III and IV. (see ICRA) Ensure compliance with the policy. Oversee all infection control aspects of construction activities. Provide education about the infection control impact of construction to staff and construction workers.
Project/Facility Manager Safety Officer (EOC) Maintenance Construction Supervisor	Representative of the Health Care Facility. Develop a plan for structural maintenance. Responsible for the daily monitoring of the construction compliance survey (see Appendix 5) that is to be reviewed as needed depending on the scope of the project and if there are compliance issues. Maintenance department will confirm specified air velocity whenever barricades are erected or modified.
Administration Engineering	Support the ICRA team to function appropriately and continuously throughout the construction phase. Prevent unnecessary exposures of patient, visitors and staff to infectious agents.
Environmental Services	Establish a mechanism for addressing and correcting problems quickly. Thoroughly clean the construction or renovation area before patients are readmitted into these areas.
Maintenance Construction Supervisor	Develop contingency plans for power failures, water supply disruptions, fires, and emergency response.
Contractor / Architects	Contractor will inform his personnel on KCH's policies that will govern their activities. Contractor will be familiar with the Infection Control Construction Permit requirements prior to construction. Contractor is responsible for maintaining equipment and replacement of HEPA and other filters in accordance with manufacturer's recommendation per contract requirements. Provide a water damage management plan (including drying protocols) for handling water intrusion from floods, leaks and condensation.

DEFINITIONS OF CONSTRUCTION ACTIVITIES: (see Appendix 1)

The amount of dust that is generated, the duration of the activity, and the amount of shared HVAC systems define the construction activity types. Contact KCH's Construction Supervisor and Infection Control if any project is questionable under these guidelines.

- A. **Type A:** Inspection and Non-Invasive activities includes but is not limited to, removal of ceiling tiles for visual inspection limited to 1 tile per 50 square feet, painting with minimal dust production, wall covering, electrical trim work, minor plumbing, and activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
- B. **Type B:** Small scale, short duration activities that create minimal dust. Includes, but is not limited to, installation of telephone and computer cabling, access to chase spaces, cutting of walls or ceiling where dust migration can be controlled.
- C. **Type C:** Any work that generates a moderate to high-level amount of dust or requires demolition or removal of any fixed building components or assemblies. Includes, but is not limited to sanding of wall for painting or wall covering, removal of floor coverings, ceiling tiles and casework, new wall construction, minor ductwork or electrical work above ceilings, major cabling activities, and any activity that cannot be completed within a single work shift.
- D. **Type D:** Major demolition and construction projects. Includes, but is not limited to activities that require consecutive work shifts, require heavy demolition or removal of a complete ceiling system and new construction.



DEFINITIONS OF INFECTION CONTROL RISK GROUPS: (see Appendix 2)

Patient Risks Groups

Low Risk	Medium Risk	High Risk	Highest Risk
<ul style="list-style-type: none"> Office areas 	<ul style="list-style-type: none"> Cardiology Echocardiography Endoscopy Nuclear Med Physical Therapy Radiology/MRI Respiratory Therapy 	<ul style="list-style-type: none"> CCU ER L&D Lab Newborn Nursery Outpatient Surgery Pediatrics Pharmacy Dietary PACU 	<ul style="list-style-type: none"> Oncology Burn units Cardiac Cath lab Central Supply Intensive care Units Medical unit Isolation rooms Operating and C-section rooms Area caring for immunocompromised patients

CLASS OF PRECAUTIONS: Construction Project by patient Risk Matrix

Step 1 Identify the type of construction activity

Step 2 Identify the patient risk group from the table above.

Step 3 Match the construction class of precaution with the designated risk group in the matrix below.

NOTE: Infection Control approval will be required when the construction activity and risk level indicates that Class III or Class IV control procedures is necessary. All infection control barrier plans, air exhaust, HVAC, routing plans, etc will be approved by infection control prior to start of project.

Construction Project Type

Patient Group Risk Level	Type A	Type B	Type C	Type D
Low Risk	I	II	II	III/IV
Medium Risk	I	II	III	IV
High Risk	I	III	III/IV	IV
Highest Risk	III	III/IV	III/IV	IV

PERFORMANCE REQUIREMENTS

- Infection Control is critical in all areas of all facilities. Construction activities causing disturbance of existing dust or creating new dust must be conducted in tight enclosures cutting off any flow of particles into patient areas.
- KCH requires any contractor, sub-contractor, material suppliers, vendors, employees or agents to be bound by these same requirements. Before construction begins on site, the Contractor's on site management team shall attend a pre-construction meeting held by KCH's Infection Control and/or Construction supervisor. They shall attend the meeting to ensure appropriate instruction of precautions for Infection Control Practices during construction or renovation.
- HEPA equipped air filtration machines will be used and a negative pressure monitor will be used to maintain a minimum negative pressure of -0.020. HEPA equipped air filtration machines shall be connected to normal power and continually operational.



- The KCH's Environment of Care or Infection Control department may modify performance requirements for certain activities.

INFECTION CONTROL PERMIT (see Appendix 4)

- An Infection Control permit is required for Class III or higher procedures. Refer to the Construction Project by patient risk matrix shaded area in the table.
- When required, obtain an approved Infection Control Permit from the Infection Control Department before beginning any construction/maintenance work.
- Permit is to be displayed at entrance to the hospital or work area during entire construction period.
- Return permit to infection control at completion of work.

BARRIERS: The area should be isolated, as the project requires.

- A closed door with masking tape applied over the frame and door is acceptable for projects, which can be contained.
- Construction, demolition or reconstruction/maintenance not capable of containment within a single room must have the following barriers erected.
 - Small duration projects generating minimal dust may use fire-rated plastic sheeting. It should be sealed at full ceiling height with 2 foot overlapping flaps for access to entry.
 - Projects that produces moderate to high levels of dust requires rigid, dust-proof, and fire rated barrier walls (dry wall/construction walls) with caulked/gasket seams for a tight seal.
 - Large dusty projects need an entry vestibule (anteroom) for removal of protective clothing or vacuum off existing clothing and tool storage.

GENERAL:

- Temporary construction barriers and closures above ceilings shall be dust tight.
- All materials entering the facility and the construction zone are disinfected completely with hospital approved disinfectant including equipment, barrier wall systems, tools, trash carts, HEPA carts etc.
- All material leaving facility will be wrapped in plastic sheeting or secured in plastic bags and placed in a securely covered transport cart/trash receptacle that has been disinfected (wiped down to remove dust and debris) with hospital approved disinfectant.
- Tacky mats will be maintained at the construction entry to the building and at the entry to the construction zone. The mats will be changed daily or more frequently if necessary to prevent accumulation of dust.
- Any dust tracked outside of barrier shall be removed immediately. Cleaning outside barrier to be by HEPA filtered vacuum or damp cloth.
- Any ceiling access panels opened for investigation beyond sealed areas shall be replaced immediately and not left unattended.
- Ensure that the supply-air and return-air vents are sealed in the construction zone to prevent contamination of the HVAC system and surrounding areas.
- When openings are made into existing ceilings, use HEPA type carts (bubbles) or provide polyethylene enclosure around ladder sealing off opening, fitted tight to ceiling and floor. Provide thorough cleaning of existing surfaces that become exposed to dust.



- Removal of construction barriers and ceiling protection shall be done carefully and only after clearance from Construction Supervisor or Infection Control. Vacuum and/or damp mop/wipe all interior barrier surfaces to remove any construction/maintenance debris/dust prior to removal of barriers.
- When access panels are opened in occupied areas for work above ceilings. Use HEPA type carts (bubbles) or polyethylene enclosure around ladder sealing off opening, fitted tight to ceiling and floor.
- All vacuuming regardless of location (under negative or positive pressure) will be completed with a certified HEPA filtered vacuum.

RESPONSIBILITIES BY ACTIVITY CLASS: (see appendix 3)

Class I

- Execute work by methods to minimize raising dust from construction operations.
- Immediately replace any ceiling tile displaced for visual inspection.
- Immediately disinfect any dust, debris or dirt that was generated.

Class II

- Provide active means to prevent-airborne dust from dispersing into atmosphere.
- Water mist work surfaces to control dust while cutting.
- Use attached vacuum for drills/saws.
- Seal unused doors with masking tape.
- Block off and seal air vents
- Wipe tools, equipment and work surfaces with disinfectant.
- Use sticky mats if needed

Class III

- Consult Infection Control department prior to construction/maintenance project activity begins to verify infection control barrier plan and scope of project.
- Obtain approved Infection Control permit from Construction Supervisor or Infection Control department before construction begins. Post in appropriate location.
- Isolate HVAC intake/output system in area where work is being done to prevent contamination of duct system and other locations.
- Complete all critical plastic/hard wall barriers before construction begins or implement HEPA type cart (bubbles). Barriers must be approved by Construction Supervisor and/or Infection Control prior to start of project.
- Maintain negative air pressure (-0.020) within the work site utilizing HEPA equipped air filtration units that are exhausted to the outside. Must be approved by Construction Supervisor and/or Infection Control prior to start of project.
- Negative air pressure monitors will be used.
- Contain construction waste before transport in plastic (or bags) and tightly covered containers.
- Cover transport receptacles or carts both when moving items in and out of facility.
- Wet mop and/or vacuum with HEPA filtered vacuum before leaving work areas including workers, carts, materials, waste carts and equipment.
- Place sticky mats at entrance and exit of work area and entrance to the facility if needed.
- Do not remove barriers from work area until cleared by Construction Supervisor and/or Infection Control.

Class IV

- Consult Infection Control Department prior to construction/maintenance project activity begins to verify infection control barrier plan and scope of project.
- Obtain approved Infection Control permit from Construction Supervisor or Infection Control department before construction begins. Post in appropriate location.



- Construction Supervisor and Infection Control will approve all construction routes prior to start of project.
- Isolate HVAC intake/output system in area where work is being done to prevent contamination of duct system and other locations.
- Complete all critical plastic/hard wall barriers before construction begins or implement HEPA type cart (bubbles). Barriers must be approved by Construction Supervisor and/or Infections Control prior to start of project.
- Maintain negative pressure (-0.020) within work site utilizing HEPA equipped air filtration units that are exhausted to the outside. Must be approved by Construction Supervisor and/or Infection Control prior to start of project.
- Negative air pressure monitors will be used
- Contain construction waste before transport in plastic (or bags) and tightly covered containers.
- Cover transport receptacles or carts both when moving items in and out of facility.
- Wet mop and/or vacuum with HEPA filtered vacuum before leaving work areas including workers, carts, materials, waste carts and equipment.
- Place sticky mats at entrance and exit of work area and entrance to the facility.
- Construct anteroom (or use prefab HEPA anteroom) and require all personnel to pass through this room so they can be vacuumed using an HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site. This is required during demolition and when dust is significant.
- All personnel entering work site are required to wear shoe covers during demolition and times when dust is significant. Shoe covers must be changed each time the worker exits the work area.
- Do not remove barriers from work area until cleared by Construction Supervisor and Infection Control.
- Contractor daily cleaning to include construction area, anterooms, all surfaces that dust can accumulate, inside barrier walls, HEPA carts and filters, floors, lights and other fixtures within the project site. Areas outside the construction site that are visibly soiled due to construction activities must be immediately cleaned. This includes cleaning and disinfection with hospital provided/approved disinfectants (cloths, mops, chemicals) and HEPA filtered vacuums.
- Construction area is required to be kept clean at all times during dusty phases of the project. This may require intermittent cleaning by contractor to keep potential dust from being tracked outside of the construction zone.
- KCH's Environmental Services will complete a deep cleaning prior to removal of any infection control barriers and area will be inspected by Construction Supervisor and/or Infection Control before returning work area to service.

ENVIRONMENTAL MONITORING

- Contractor is responsible for maintaining equipment and replacement of HEPA and other filters in accordance with manufacturer's recommendations and infection control plans.
- KCH will monitor infection control requirements are met on a daily basis during the project and communicate deficiencies to the contractor for immediate remediation or in cases of patient/staff safety risks will stop construction activities until issues are resolved.

ENFORCEMENT

- Construction Supervisor, Infection Control, Hospital Supervisor, Project Manager, Safety Officer and the Environment of Care Committee have authority to shut down a project whenever a potential or actual hazardous infection control deficiency exists.
- Construction Supervisor and/or Infection Control will record the following:
 - Document each violation with photographs
 - Maintain a record of all infection violations.



REFERENCES:

Hansen, W. 2001. "Infection Control During Construction" *A Guide to Prevention and JCAHO COMPLIANCE.*

APIC, 2000 "The role of infection control during construction in health care facilities"

APIC, Infection Control Tool Kit Series: Construction and Renovation.

CONSTRUCTION COMPLIANCE SURVEY

Project: _____ **Review Date:** _____ **Observed by:** _____

Location	Standards	Not Met	Met	N/A	Responsible Person / Comment
	Contractors wearing required identification and signs posted for the area				
	Construction Personnel wearing required PPE (coveralls, booties, hard hats, respirators)				
	Negative Air Pressure <ul style="list-style-type: none"> • All windows closed behind area • Negative pressure maintained • Exhaust fans functioning • Air quality adequate • No excess fumes 				
	Contractors following safe work practices				
	Walk-off mats adequate and clean to control dust				
	Construction Barriers appropriate for patient population <ul style="list-style-type: none"> • Sealed plastic with overlay • Hard barrier with door • Closed patient doors sealed with tape • HEPA carts (bubbles) 				
	Project area <ul style="list-style-type: none"> • Debris removed from construction area daily • Trash contained/transported appropriately • Routine cleaning done of the jobsite • Minimal dust • Daily wet mop, cleaning 				
	Traffic Control <ul style="list-style-type: none"> • Workers following approved routes 				

Additional Comments/Actions:



INFECTION CONTROL RISK ASSESSMENT

Matrix of Precautions for Construction and Renovation/Maintenance

STEP ONE:

Using the following table identify: **Type of Construction Project Activity--Type A-D**

Type A	<p>Inspection and Non-invasive Activities</p> <p>Includes, but not limited to:</p> <ul style="list-style-type: none"> ◆ Removal of ceiling tiles for visual inspection--limited to 1 tile per 50 square feet; ◆ Painting, but not sanding ◆ Wall covering, electrical trim work, minor plumbing, and activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
Type B	<p>Small Scale, Short Duration Activities that Create Minimal Dust</p> <p>Includes, but not limited to:</p> <ul style="list-style-type: none"> ◆ Installation of telephone and computer cabling; ◆ Access to chase spaces; and cutting of walls or ceiling where dust migration can be controlled.
Type C	<p>Work that Generates a Moderate to High Level of Dust or Requires Demolition or Removal of Any Fixed-Building Components or Assemblies</p> <p>Includes, but not limited to:</p> <ul style="list-style-type: none"> ◆ Sanding of walls for painting or wall covering; ◆ Removal of floor coverings, ceiling tiles, and casework; ◆ New wall construction; ◆ Minor duct work or electrical work above ceilings; ◆ Major cabling activities; and any activity that cannot be completed within a single work shift.
Type D	<p>Major Demolition and Construction Projects</p> <p>Includes, but not limited to:</p> <ul style="list-style-type: none"> ◆ Activities that require consecutive work shifts; ◆ Requires heavy demolition, removal of a complete cabling system; and new construction.

STEP TWO:

Using the following tables identify: **Patient Risk Groups** who will be affected. If more than one risk group will be affected, select the higher risk group.

LOW RISK	MEDIUM RISK	HIGH RISK	HIGHEST RISK
<ul style="list-style-type: none"> ◆ Office Areas 	<ul style="list-style-type: none"> ◆ Cardiology ◆ Echocardiography ◆ Endoscopy ◆ Nuclear Medicine ◆ Physical Therapy ◆ Radiology/MRI ◆ Respiratory Therapy 	<ul style="list-style-type: none"> ◆ Critical Care Unit ◆ Emergency Room ◆ Labor and Delivery ◆ Laboratories (specimen) ◆ Newborn Nursery ◆ Outpatient Surgery ◆ Pediatrics ◆ Pharmacy ◆ Post Anesthesia Care Unit ◆ Surgical Units ◆ Dietary 	<ul style="list-style-type: none"> ◆ Any area caring for immuno-compromised patients ◆ Burn Unit ◆ Cardiac Cath Lab ◆ Central Sterile Supply ◆ Intensive Care Units ◆ Medical Unit ◆ Negative pressure isolation rooms ◆ Oncology ◆ Operating Rooms, including C-Section Rooms



STEP THREE:

Match:

Patient Risk Groups – Low, Medium, High and Highest

Construction Project Type – A, B, C and D

Class of Precautions – I, II, III, or IV, or level of infection control activities required.

Class I-IV or **Color-coded Precautions** are delineated on the following page.

IC Matrix Class of Precautions: Construction Project by Patient Risk

PATIENT RISK GROUP	CONSTRUCTION PROJECT TYPE			
	Type A	Type B	Type C	Type D
LOW Risk Group	I	II	II	III/IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III/IV	IV
HIGHEST Risk Group	II	III/IV	III/IV	IV

NOTE: Infection Control approval will be required when the Construction Activity and Risk Level indicate that **Class III** or **Class IV** control procedures is necessary.

Adapted with permission V Kennedy, B Barnard, St Luke Episcopal Hospital, Houston Texas ECSIASHE PDC 2001

DESCRIPTION OF REQUIRED INFECTION CONTROL PRECAUTIONS BY CLASS

	During Construction Project	Upon Completion of Project
Class I	<ol style="list-style-type: none"> 1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection. 	<ol style="list-style-type: none"> 1. Wipe work surfaces with disinfectant.
Class II	<ol style="list-style-type: none"> 1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape 4. Block off & seal air vents. 5. Place dust mat at entrance and exit of work area. 6. Remove or isolate HVAC system in areas where work is being performed. 	<ol style="list-style-type: none"> 1. Wipe work surfaces with disinfectant. 2. Contain construction waste before transporting in tightly covered containers. 3. Wet mop and/or vacuum with an HEPA filtered vacuum before leaving work area. 4. Remove isolation of HVAC system in areas where work is being performed.
Class III	<ol style="list-style-type: none"> 1. Remove or isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers, e.g., sheet rock, plywood, plastic to seal area from non-work, area or implement control-cube method (cart with a plastic covering and sealed connection to the work site, with an HEPA vacuum for vacuuming, prior to exit) before construction begins. 3. Maintain negative air pressure within work site, utilizing HEPA equipped air-filtration units. 4. Contain construction waste for transport in tightly covered containers. 5. Cover transport receptacles or carts. Tape covering, unless solid cover. 	<ol style="list-style-type: none"> 1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department, and thoroughly cleaned by the owner's Environmental Services Department. 2. Remove barrier materials carefully to minimize the spreading of dirt and debris associated with construction. 3. Vacuum work area with HEPA filtered vacuums. 4. Wet mop area with disinfectant. 5. Remove isolation of HVAC system in areas where work is being performed.
Class IV	<ol style="list-style-type: none"> 1. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers, e.g., sheet rock, plywood, plastic to seal area from non-work area, or implement control cube method (cart with a plastic covering and sealed connection to the work site, with an HEPA vacuum for vacuuming, prior to exit) before construction begins. 3. Maintain negative air pressure within work site, utilizing HEPA equipped air-filtration units. 4. Seal holes, pipes, conduits, and punctures appropriately. 5. Construct anteroom and require all personnel to pass through this room so that they can be vacuumed off using an HEPA vacuum cleaner before leaving work site, or they can wear cloth or paper coveralls that are removed each time they leave the work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area. 7. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department, and thoroughly cleaned by the owner's Environmental Services Department. 	<ol style="list-style-type: none"> 1. Remove barrier material carefully to minimize the spreading of dirt and debris associated with construction. 2. Contain construction waste before transporting in tightly covered containers. 3. Cover transport receptacles or carts. Tape covering, unless the cover is tightly secure. 4. Vacuum work area with HEPA filtered vacuums. 5. Wet mop area with disinfectant. 6. Remove isolation of HVAC system in areas where work is being performed.



Location of Construction: _____				Permit No.: _____			
Project Coordinator: _____				Project Start Date: _____			
Contractor Performing Work: _____				Estimated Time of Completion: _____			
Supervisor: Telephone: _____				Permit Expiration Date: _____			
YES	NO	CONSTRUCTION ACTIVITY	YES	NO	INFECTION CONTROL RISK GROUP		
		TYPE A: Inspection, non-invasive activity			GROUP 1: Low Risk		
		TYPE B: Small scale, short duration, moderate to high levels			GROUP 2: Medium Risk		
		TYPE C: Activity generates moderate to high levels of dust, requires greater one work shift for completion.			GROUP 3: Medium/High Risk		
		TYPE D: Major duration and construction activities requiring consecutive work shifts.			GROUP 4: Highest Risk		
CLASS I		<ol style="list-style-type: none"> 1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace any ceiling tile displaced for visual inspection. 3. Minor demolition for remodeling. 					
CLASS II		<ol style="list-style-type: none"> 1. Provides active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Wipe surfaces with disinfectant. 6. Contain construction waste before transporting in tightly covered containers. 7. Wet mop and/or vacuum with an HEPA filtered vacuum before leaving work area. 8. Place dust mat at entrance and exit of work area. 9. Remove or isolate HVAC system in areas where work is being performed. 					
CLASS III		<ol style="list-style-type: none"> 1. Obtain infection control permit before construction begins. 2. Isolate HVAC system in area where work is being done to prevent contamination of the duct system. 3. Complete all critical barriers or implement control cube method before construction begins. 4. Maintain negative air pressure within work site, utilizing HEPA equipped air-filtration units. 5. Do not remove barriers from work area until complete project is thoroughly cleaned by Environmental Services Department. 6. Vacuum work with HEPA filtered vacuums. 7. Wet mop with disinfectant. 8. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 9. Contain construction waste before transport in tightly covered containers. 10. Cover transport receptacles or carts, and tape covering. 11. Remove or isolate HVAC system in areas where work is being performed. 					
CLASS IV		<ol style="list-style-type: none"> 1. Obtain infection control permit before construction begins. 2. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 3. Complete all critical barriers or implement control cube method before construction begins. 4. Maintain negative air pressure within work site, utilizing HEPA equipped air-filtration units. 5. Seal holes, pipes, conduits, and punctures appropriately. 6. Construct anteroom and require all personnel to pass through this room so that they can be vacuumed off using an HEPA vacuum cleaner before leaving work site, or they can wear cloth or paper coveralls that are removed each time they leave the work site. 7. All personnel entering the work site are required to wear shoe covers. 8. Do not remove barriers from the work area, until completed project is thoroughly cleaned by the Environmental Service Department. 9. Vacuum work area with HEPA filtered vacuums. 10. Wet mop with disinfectant. 11. Remove barrier materials carefully to minimize the spreading of dirt and debris associated with construction. 12. Contain construction waste before transporting in tightly covered containers. 13. Cover transport receptacles or carts, and tape covering. 14. Remove or isolate HVAC system in areas where construction is being done. 					
Additional Requirements:							
				Exceptions and/or additions to this permit are noted by attached memoranda.			
Date: _____		Initials: _____		Date: _____		Initials: _____	
Permit Requested By: _____				Permit Authorized By: _____			
Date: _____		Date: _____		Date: _____		Date: _____	

SECTION 01120 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. 01732 – Cutting and Patching.

PART 2 - PRODUCTS

2.01 SALVAGED MATERIALS

- A. Salvage sufficient quantities of cut or removed material to replace damaged work of existing construction, when materials not readily obtainable on current market.
- B. Incorporate salvaged or used material only as indicated or with permission of the Hospital.

2.02 PRODUCTS FOR PATCHING AND EXTENDING WORK

- A. New Materials: Match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspection and testing products where necessary, referring to existing Work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that demolition is complete, and areas are ready for installation of new Work.
- B. Beginning of restoration Work means acceptance of existing conditions.

3.02 PREPARATION

- A. Cut, move or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specific for finished Work.

- C. Remove debris and abandoned items from area and from concealed spaces.
- D. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.
- E. Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity. Insulate duct work and piping to prevent condensation in exposed areas.
- F. Do not demolish, chip, or penetrate existing structural members without the expressed approval of the Prime Consultant.
- G. Perform cutting and removal work to remove minimum necessary, and in a manner to avoid damage to adjacent work and provide proper surfaces to receive installation of repair and new Work.

3.03 INSTALLATION

- A. Coordinate work of alterations and renovations to expedite completion and to accommodate Owner occupancy.
- B. Project areas and Finishes: Complete in all respects including operational, carpentry, casework, mechanical and electrical work.
- C. Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original or specified condition as appropriate.
- D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- E. In addition to specified replacement of equipment and fixtures, restore existing plumbing, ventilation, air conditioning, air balancing and electrical systems to full operational condition.

3.04 TRANSITIONS

- A. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patched Work to match existing adjacent Work in texture and appearance.

- B. Cut finish surfaces such as masonry, tile, plaster, or metals by methods to terminate surfaces in a straight line at a natural point of division.
- C. When finished surfaces are cut so that a smooth transition with new Work is possible, terminate existing surface along a straight line at a natural line of division. If a straight line cannot be achieved, install a reveal or other joint to create a straight line. Provide trim appropriate to finished surface subject to approval of Hospital's Representative.

3.05 ADJUSTMENTS

- A. Where removal of partitions or walls result in adjacent spaces becoming one, rework floors, walls and ceiling to a smooth plane without breaks, steps or bulkheads.
- B. Where a change of plane 1/4 inch or more occurs, submit recommendation for providing a smooth transition for the WHFD AND/OR PROJECT MANAGER review.
- C. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.
- D. At penetrations of fire-rated wall, ceiling or floor construction, completely seal voids with fire rated, fire resistant material, full thickness of the construction element. All remaining small gaps shall be properly sealed with firestopping.

3.06 REPAIR OF DAMAGED SURFACES

- A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- B. Repair substrate prior to patching finish.

3.07 FINISHES

- A. Finish surfaces as specified in individual Product Sections.
- B. Finish patches to product uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersection with written approval of the WHFD AND/OR PROJECT MANAGER.

3.08 CLEANING

- A. In addition to cleaning as specified in this specification. Wet mop owner- occupied areas daily utilizing hospital's EPA approved disinfectant. Remove and replace soiled walk off (sticky) mats daily.
- B. Clean spillage, over-spray, and dust in Owner- occupied areas immediately.

END OF SECTION

SECTION 01230 - ALTERNATES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.
- B. The description of alternates is not intended to give a detailed description of all additional or deductive work required by the alternate item(s), as only the principal features of such additional or deductive work are listed.
- C. Should any one or all of the alternates become a part of the contract, the cost of all additional incidental work required by the alternate item(s), even though not specifically mentioned herein, shall be deemed to already be included in the alternate price amount.

1.02 DEFINITIONS

- A. Alternate: An amount proposed by Bidders (Offerors) and stated on the Bid Form for certain work defined herein that may affect the Total Lump Sum Bid Price amount if State decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition or deduction from the Contract Sum to incorporate the alternate into the Work. No other adjustments are made to the Contract Sum.

1.03 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into the Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

- B. Notification: If the alternate(s) are accepted by the Hospital, immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: The purchase and installation of Falkbuilt modular partitions, doors, ceiling soffits, light fixtures, and casework in place of select onsite construction of partitions, doors, and ceiling soffits, light fixtures, and casework. The Falkbuilt scope of work is identified in drawings provided by Falkbuilt which are included at the end of the contract drawings. Reference Specification Section 10 22 00 Partitions (Alternate). All work and construction remaining in the contract drawings shall be priced and included in the Alternate No. 1 Lump Sum Subtotal.

END OF SECTION

SECTION 01260 - CONTRACT CONSIDERATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Schedule of values.
- B. Application for payment.
- C. Change procedures.

1.02 RELATED SECTIONS

- A. Section 01100 – Summary of Work.
- B. Section 01290 – Payment Procedures.
- C. Section 01310 – Project Management and Coordination.
- D. Section 01770 – Closeout Procedures.

1.03 SCHEDULE OF VALUES

- A. Submit a printed schedule of AIA Form G703- Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be acceptable.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner Contractor Agreement.
- C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization and bonds and insurance.
- D. 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.
- E. Include within each line item, a direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application for Payment.

1.04 APPLICATIONS FOR PAYMENT

- A. Submit each application electronically on AIA Form G702- Application and Certificate for Payment and AIA G703 - Continuation Sheet.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Payment Period: Invoice to be submitted to Hospital Technical Representative for the preceding month's work by the 5th day of the month that follows. (The State of Hawaii does its best to pay within 30 days).
- D. Waiver of Liens: Provide unconditional waiver of liens. Use contractor's form.

1.05 CHANGE PROCEDURES

- A. The following documents will be used. Sample forms are attached.
- B. Request for Information: Standard Contractor form. A request for information shall be used by the Contractor to the Prime Consultant to request solutions to problems which are discovered during construction, to request drawings and cost and/or schedule impacts in the Request for Information.
- C. Instruction Notice: Attachment 1, standard form.
 - 1. Instruction Notice will be issued by the Prime Consultant for instructions to the Contractor which do not involve a change in the Contract Sum or construction period.
 - 2. Instruction Notice authorizes the Contractor to proceed at once with the instruction included therein.
 - 3. Instruction Notice which does affect the Contract Sum or construction period must have written authorization by the Owner's Project Manager. Such instruction shall have the note "Change Order to Follow" and then be followed with a Quotation Request, cross referenced to the Field Order.
 - 4. Instruction Notice will be distributed as follows:
 - a. Two copies to Contractor
 - b. One copy to the Prime Consultant
 - c. One copy to each appropriate Consultant
 - d. One copy to WHFD AND/OR PROJECT MANAGER

D. Quotation Requests: Attachment 2, standard Prime Consultant form.

1. Proposed changes to the Contract will be initiated by the Prime Consultant in the form of a Quotation Request.
2. A Quotation Request, indicating the party suggesting the change, will clearly describe the proposed Contract variation, accompanied by the required drawings, if necessary.
3. Construction work shall not proceed on the strength of a Quotation Request only.
4. Quotation Requests will be distributed as follows:
 - a. Two copies to Contractor.
 - b. One copy to Prime Consultant
 - c. One copy to each appropriate Consultant
 - d. One copy to Owner's Project Management
5. The Contractor shall respond to the Quotation Request within the time stated on the form.

E. Change Proposal. Standard Contract Form.

1. This form shall be issued by the Contractor for any claims he may have and in response to a Quotation Request.
2. The Change proposal shall include a description of the work and the requested change to the Contract sum and construction time.
3. All supporting documents, materials and subcontract quotations, time sheets, labor estimates, etc., shall be itemized and attached to the Change Proposal as necessary for proper checking by the Prime Consultant, Consultants and Owner's Project Manager.
4. Change proposals, if acceptable, will be signed by the WHFD AND/OR PROJECT MANAGER and Prime Consultant with one executed copy returned to Contractor. The Contractor shall thus have the authority to proceed with the work and Change Order will follow.

- F. Change Order. Attachment 3, standard form.
1. This document is issued to the Contractor as an instruction for him to make a change to the work of the contract Documents.
 2. Change Order documents are prepared by the Prime Consultant and countersigned by the Owner and Contractor.
 3. Approved Change orders record the following information:
 - a. Cross-reference to Change Proposal.
 - b. Summarized description of change in work required.
 - c. Change in completion date.
 - d. Change in Contract sum.
 - e. Identification of party/individual initiating change.
- G. Record of Variations: Variations in construction from the plans and specifications shall be recorded by the Contractor as required in Division 1. These variations shall be brought to the attention of the Prime Consultant and WHFD ANS/OR PROJECT MANAGER by the Contractor.
- H. Timeliness of Processing: Instruction notices, Quotation Requests and Change Proposals will be processed and one copy provided the WHFD AND/OR PROJECT MANAGER the same day the document is prepared.
- I. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract Time as provided in the Contract Documents.
- J. Maintained detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

INSTRUCTION NOTICE

INSTRUCTION NOTICE NO:

DATE:

PROJECT NO:

PROJECT: Kona Community Hospital
Outpatient Oncology Services Clinic

CONTRACTOR:

Reference:

- Specifications:**
- Drawings:**
- Other:**

YOU ARE HEREBY DIRECTED TO PROMPTLY EXECUTE THIS INSTRUCTION NOTICE WHICH REPRESENTS THE CONTRACT DOCUMENTS OR ORDERS MINOR CHANGES IN THE WORK.

If you consider that a change in Contract Sum or Contract Time is required, submit your itemized proposal to the Prime Consultant immediately and before proceeding with the work. If your proposal is found to be satisfactory and in proper order, this Instruction Notice will be superseded by a Change Order.

COPIES TO:

- WHFD AND/OR PROJECT MANAGER**
- Contractor**
- Prime Consultant**
- Structural**

- Mechanical**
- Electrical**
- Civil**
- Landscape**
- Others**

Attachment 1
Attachment 2

OPTIONAL

QUOTATION REQUEST

QUOTATION REQUEST NO:

DATE: **PROJECT NO:**

PROJECT: Kona Community Hospital
 Outpatient Oncology Services Clinic

CONTRACTOR:

Submit a fully itemized quotation for the inclusion of the following changes into the contract. This is not a Change Order, a Construction Change Directive, nor an Instruction to proceed with the work herein.

REQUEST ORIGINATED BY:

KONA COMMUNITY HOSPITAL
OUTPATIENT ONCOLOGY SERVICES CLINIC
RFP# 24-0005

Contract Considerations
01260 - 6

DATE QUOTATION REQUIRED BY:

COPIES TO:

- WHFD AND/OR PROJECT MANAGER**
- Contractor**
- Others**

Attachment 2

Attachment 3

CHANGE ORDER

CHANGE ORDER NO:

DATE:

PROJECT NO:

PROJECT: Kona Community Hospital
Outpatient Oncology Services Clinic

CONTRACTOR:

Original Contract Sum was:

Net changes by previously authorized Change Orders: \$

Contract Sum prior to this Change Order was: \$

Contract sum will be (increased) (decreased) (unchanged) by this Change Order \$

New Contract Sum including this Change Order will be: \$

The Contract Time will be (increased) (decreased) (unchanged) by days

The date of Substantial Completion as of the date of this Change Order is:

**PRIME CONSULTANT:
CONTRACTOR:**

WHFD AND/OR PROJECT MANAGER:

By: _____
Approved by: _____
Accepted by: _____

Date: _____
Date: _____
Date: _____

Attachment 3

SECTION 01270 - VARIABLE QUANTITIES UNIT PRICES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.

1.02 DEFINITIONS

- A. Unit price is an amount proposed by the Bidder (or Offeror) as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.03 RELATED DOCUMENTS

- A. Variations in estimated quantities are governed by this Section, Section 00400 - Bid Proposal Form, the Drawings and the General Requirements.
- B. Measurement and payment for unit price items are governed by the General Requirements.

1.04 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, coordination overhead, and profit.
- B. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.
 - 1. The description of Variable Quantities Unit Price items is not intended to give a detailed description of all work required, as only principal features of such work are listed.
 - 2. Detailed descriptions are given in the appropriate Specification Sections or Drawings named in the general description below.
- C. Include Variable Quantities Unit Price costs on the Bid Proposal form.
- D. All computations of the Variable Quantities Unit Prices shall use the unit prices noted in the Bid Proposal Form. Measurements will be to the nearest estimated

unit quantity. Payment will be made for quantities actually installed at the applicable price, measured by the Offeror, concurred by the WHFD AND/OR PROJECT MANAGER, and acceptably completed.

- E. The Variable Quantities Unit Prices are estimated quantities. Where the quantity of a pay item vary more than fifteen percent (15%) above or below the estimated quantity stated in the contract, an adjustment in the contract price shall be made upon demand by either the State or Contractor. The adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred fifteen percent (115%) or below eighty-five percent (85%) of the estimated quantity.
- F. Do not proceed with work exceeding the estimated quantities written in the Bid/Offer/Proposal Form until receipt of written approval by the WHFD AND/OR PROJECT MANAGER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 LIST OF VARIABLE QUANTITIES

Unit Price No. 1: Firestopping - Provide firestopping around all penetrations through fire rated walls.

END OF SECTION

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - PRODUCTS

1.01 GENERAL CONDITIONS

- A. As specified in the Request for Proposals and the General Requirements.

1.02 RELATED SELECTIONS

- A. Section 01260 - Contract Considerations.
- B. Section 01770 – Closeout Procedures.

1.03 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Application for Payment.

1.04 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to the Prime Consultant through the Hospital's Construction Management Representative at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: include the following Project identification on the schedule of

values:

- a. Project name and location.
 - b. Name of Prime Consultant.
 - c. Prime Consultant's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
2. Arrange schedule of values using AIA Document G703.
 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work
 - c. Name of subcontractor
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affected value.
 - g. Dollar value of the following, as percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - i. Labor.
 - ii. Materials.
 - iii. Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of two percent of the Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling two percent of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
7. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
8. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
9. Each item in the schedule of values and Application for Payments shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.05 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as approved by the Hospital Construction Project Manager.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Each progress payment shall be submitted monthly.
- C. Payment Application Times: Submit Application for Payment to the Prime Consultant by the 5th day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

- D. Application for Payment Forms: Use AIA G702 and Document AIA G703.
- E. Application Preparation: Complete every entry on form. Contract number must be on every application for payment. The Prime Consultant will return incomplete applications, including those without the contract number, without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide supporting documentation that verifies amount requested, such as paid invoices and/or photographs. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
- G. Transmittal: submit signed Application for Payment to Hospital Construction Project Manager (electronically or by hand delivery). Include waivers of lien and other similar required attachments.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When application shows completion of an item, submit conditional final or full waivers.

3. WHFD AND/OR PROJECT MANAGER reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Waiver of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-contractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. WHFD AND/OR PROJECT MANAGER reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or proceeded by conditional final waivers from every entity involved with performance of the work covered by the application who is lawfully entitled to a lien.
 5. Waiver forms: Submit executed waivers of lien forms, acceptable to Owner.
- J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Schedule of unit prices.
 6. Submittal schedule (preliminary of not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal's consultants.
 9. Copies of building permits.

10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
- K. Application for Payment at Substantial Completion: After Prime Consultant issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- L. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims".
 5. AIA Document G706A, "Contractor's Affidavit of Releases of Liens".
 6. AIA Document G707, "Consent of Surety to Final Payment".
 7. Evidence that claims have been settled.
 8. Final liquidated damages settlement statement.

9. Alternate forms may be utilized with approval from the WHFD AND/OR PROJECT MANAGER & Contracts Manager

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General Coordination procedures.
- B. Coordination drawings.
- C. Requests for information (RFI's).
- D. Project Web site.
- E. Project Meetings.

1.02 RELATED SECTIONS

- A. Section 01260 - Contract Considerations.
- B. Section 01330 - Submittal Procedures.
- C. Section 01770 – Closeout Procedures.

1.03 DEFINITIONS

- A. RFI: (Request for Information), the Prime Consultant for seeking information required by or clarifications of the Contract Documents.

1.04 INFORMATION SUBMITTALS

- A. Subcontract List: Prepare a written summary (provided in the Bid Proposal Form) identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Included the following information in tabular form:
 - 1. Name, address and telephone number of company performing subcontract or supplying products.
 - 2. The particular work to be performed by subcontractor.
- B. Key personnel Names: Within 7 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office

and cellular telephone numbers and e-mail addresses. Provide names, addresses and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office and by each temporary telephone. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operations.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors of coordination of their Work is required.

- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and (activities of other contractors) to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Pre-installation of conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designed as Owner's property.

1.06 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contracts in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions and show on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Prime Consultant indicating proposed resolution of such conflicts. Minor dimensions changes and difficulty installations will not be considered changes to the Contract.
- B. Coordinating Drawing Organization: Organize coordination drawings as follows:
 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements and mechanical, plumbing, fire-protection, fire-alarm and electrical work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: indicate sub-framing for support of ceiling and wall systems,

mechanical and electrical equipment, and related work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas conflict between light fixtures and other components. All work to be seismically anchored utilizing TOLCO system.

3. Mechanical rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges and support systems. All work to be seismically anchored using TOLCO system.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire –rated enclosures around ductwork.
7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, main piping, branch lines, pipe drops and sprinkler heads.
 9. Review: Prime Consultant will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Prime Consultant determines that coordination drawings are not being prepared in sufficient scope or details, or are otherwise deficient, Prime Consultant will so inform Contractor, who shall make changes as direct and resubmit.
 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements on Section 013300 - Submittal Procedures.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 3. Prime Consultant will furnish Contractor one set of digital data files of Drawings for use in preparing coordinated digital data files.
 - a. Digital Data Software Program: Drawings are available in AutoCAD 2010.
 - b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to WHFD AND/OR PROJECT MANAGER and Prime Consultant, if required by either party.

1.07 REQUESTS FOR INFORMATION (RFI'S)

- A. General: Immediately of discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified to WHFD AND/OR PROJECT MANAGER.
 1. All RFIs must be submitted directly by the Contractor of record. Prime Consultant will return RFI submitted to Prime Consultant by other entities controlled by Contractor with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Project Engineer.
 6. RFI number; number sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, description, measures, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thickness, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
 14. Response turnaround time needed.
- C. RFI Forms: Contractor's form
1. Attachment shall be electronic files preferably in Adobe Acrobat PDF format.

- D. Project Prime Consultant's Action: Project Prime Consultant will review each RFI, determine action required and respond within requested response time, typically 5 working days unless quicker response is needed as to not delay the project.
1. The following Contract-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's mean and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustment in the Contract Time or Contract Sum.
 - f. Requests for interpretation of Prime Consultant's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. The Prime Consultant's action may include a request for additional information, in which case the time for response will date from time of receipt of additional information.
 3. The Project Prime Consultant's action on RFIs that may result in a change to the Contract Time or the Contract sum may be eligible for Contractor to submit Change Proposal according to Section 01260 - Contract Considerations.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify the WHFD AND/OR PROJECT MANAGER in writing within 3 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log as changes are made to Prime Consultant.
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Project Prime Consultant.
 4. RFI numbering including RFIs that were returned without action or withdrawn.

5. RFI description.
6. Date when the RFI was submitted.
7. Date when the Prime Consultant's response was received.

1.08 PROJECT MEETINGS

- A. General: When applicable, schedule and conduct meetings at the Project site and other meetings to occur by teleconference and/or video conference (collectively referred to as "meetings").
 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify WHFD AND/OR PROJECT MANAGER and Prime Consultant of scheduled meeting dates and times. It is preferred that a standing meeting day/time is planned at the commencement of the project.
 2. Agenda: Contractor shall prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Sign in Sheet: Furnish and supply a copy of completed sheet to KCH.
 4. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to all meeting attendees within five business days of the meeting.
- B. Preconstruction Conference: the WHFD AND/OR PROJECT MANAGER will schedule and conduct a preconstruction conference before starting construction, at a time convenient to the Hospital, Contractor, and Prime Consultant, but no later than 15 days after execution of the Agreement.
 1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of WHFD AND/OR PROJECT MANAGER, the Prime Consultant and their consultants; Contractor and its superintendent; major subcontractors; suppliers and other concerned parties. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the

following:

- a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.
 - d. Lines of communications.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Application for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Use of the premises.
 - l. Work restrictions.
 - m. Working hours.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Procedures for moisture and mold
 - q. Procedures for disruption and shutdowns.
 - r. Parking availability.
 - s. Office, work, and storage areas.
 - t. Equipment deliveries and properties.
 - u. Security.
4. Minutes: The Contractor will be responsible for conduction of the meeting, will record and distribute meeting minutes.

C. Preinstall Conferences: Conduct a pre-installation conference at Project Site before each construction activity that requires coordination with other construction trades and/or installers.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installation that have preceded or will follow, shall attend the meeting. Advise the WHFD AND/OR PROJECT MANAGER, Prime Consultant of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements to the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility requirements.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written instructions.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.

- r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Installation procedures.
 - u. Coordination with other work.
 - v. Required performance results.
 - w. Protection of adjacent work.
 - x. Protection of construction and personnel.
3. Record significant conference discussions, agreement, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date
- D. Progress Meetings: Conduct weekly progress meetings, or at intervals necessary to the orderly progress of the Work.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: Representatives of the WHFD AND/OR PROJECT MANAGER, and the Contractor. The Project Prime Consultant will call in by telephone. The Prime Consultant will attend meetings in person when necessary. The Prime Consultant's subconsultants and Contractor's subcontractors may attend upon request.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule or behind schedule, in relation to Contractor's construction schedule.

Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- i. Review schedule for next period
 - b. Review present and future needs of each entity present, including the following:
 - i. Interface requirements.
 - ii. Sequence of operations.
 - iii. Owner operation issues/security.
 - iv. Status of submittals.
 - v. Deliveries.
 - vi. Off-site fabrication.
 - vii. Access
 - viii. Temporary facilities and controls.
 - ix. Status of RFIs.
 - x. Status of proposed requests.
 - xi. Pending changes.
 - xii. Status of change Orders.
 - xiii. Pending claims and disputes.
4. Minutes: The Contractor that is responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01330 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed Products list.
- D. Shop Drawings.
- E. Product Data.
- F. Samples.
- G. Manufacturer's installation instructions.
- H. Manufacturer's certificates.

1.02 RELATED SECTIONS

- A. Section 01310 – Project Management and Coordination.
- B. Section 01400 - Quality Requirements.
- C. Section 01500 – Temporary Facilities and Controls.
- D. Section 01600 – Product Requirements.
- E. Section 01730 – Execution Requirements.
- F. Section 01732 – Cutting and Patching.

1.03 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Prime Consultant's responsive action.
- B. Informational Submittals: Written information that does not require Prime Consultant's approval. Submittals may be rejected for not complying with requirements.

1.04 SUBMITTAL PROCEDURES

- A. Transmit each submittal with AIA Form G810 or project Prime Consultant's accepted transmittal form.
 - 1. Identify whether submittal is an action submittal or informational submittal.
 - 2. Submit the number of duplicate documents and samples schedule in Part 3 below.
- B. Sequentially number the transmittal form. Reverse submittals with original number and a sequential alphabetical suffix.
- C. Identify Project Contractor, Subcontractor or supplier, pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's wax seal, signed or initialed certifying that review, 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.
- E. Schedule submittals to expedite the Project, and deliver to Prime Consultant at business address. Coordinate submission of related items.
- F. For each submittal for review, allow 10 days excluding delivery time and from the contractor.
- G. Identify variations from Contract Documents and Product of system limitations which may be detrimental to successful performance of the completed Work.
- H. Submit all items relating to color selection at one time. Color selections will not be made until all color related submittals have been received.
- I. Provide space for Contractor, Prime Consultant, and Consultants review stamps or initials.
- J. Review and Resubmission of Submittals
 - 1. The Prime Consultant will review the submittal and stamp or initial it with indication of action as appropriate. Prime Consultant will retain one copy or and furnish one copy to Contractor. Consultants will retain one copy.
 - 2. Submittals returned marked "resubmit" or "rejected". Make corrections and resubmit.
 - a. Direct specific attention on resubmittals to revision other than those

requested by the Prime Consultant on previous submittals.

- b. Make shop drawing corrections on the original drawing and print.
- 3. Submittals returned with markings or comments and marked "confirm". Submit a letter indicating acceptance of comments and stating that Contractor will comply with marks and comments.
- 4. Submittals returned marked "No Exceptions Taken". Submit number of copies mechanical and electrical items with Contractor.
- K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with provisions.
- L. Submittal is not requested will not be recognized or processed.

1.05 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit as part of the Monthly Report required by the Owner-Contractor Agreement.

1.06 PROPOSED PRODUCTS LIST

- A. Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.07 SHOP DRAWINGS

- A. Present in a clear and thorough manner, accurately and at a scale sufficient to show pertinent aspects. Indicate fabrication, layout, anchorage and installation details.
- B. Title each drawing. Identify details by reference to Contract Drawing and detail numbers.
- C. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Drawing Size: Minimum 8-1/2 inches by 11 inches and maximum 30 inches by 42 inches.

- E. Shop Drawings: Submit review. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above.

1.08 PRODUCT DATA

- A. Clearly mark each copy to identify each applicable product, model, option, and pertinent data for the products or systems to be provided. Supplement manufacturers' standard data to provide information unique to this Project.
- B. Highlighting will not be acceptable.
- C. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. After review distribute in accordance with the Submittal Procedures article above.

1.09 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Prime Consultant selection.
 - 1. Provide custom color samples where requested.
- C. Reviewed samples which may be used in the Work are indicated in individual specification sections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE OF SUBMITTALS

- A. Product Data, Schedules, Shop Drawings and Other Printed Materials: Submit the number of copies which the Contractor requires, plus copies for the following:
 - 1. One copy: Prime Consultant.
 - 2. One copy: WHFD AND/OR PROJECT MANAGER.

3. One copy: Hospital Construction Project Manager.

4. Copies as required from consultants.

B. Samples: Submit the number of samples which the Contractor requires plus one for WHFD AND/OR PROJECT MANAGER and Contracts Manager.

Section No. - Title	Shop Drawings & Diagrams	Samples	Certifications (Materials, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
01290 – Payment Procedures														■		
01310 – Project Management & Coordination														■		
1450 - Moisture Vapor Test			■				■	■								
01600 – Product Requirements														■		
01770 – Closeout Procedures	■	■	■	■			■		■			■	■	■	■	■
01783 – Project Record Documents				■						■	■		■	■		
03 54 16 – Hydraulic Cement Underlayment			■	■										■		
05 05 23 – Metal Fastenings		■		■												
05 40 00 – Cold-Formed Metal Framing				■												
05 50 10 – Interior Metal Fabrications	■		■	■		■								■	■	
06 10 54 – Interior Misc. Rough Carpentry	■	■	■	■										■	■	
06 41 19 – Plastic Laminate-Clad Wood Casework	■	■	■	■										■	■	
06 64 23 - Decorative polymer panels	■	■	■	■										■	■	

Section No. - Title	Shop Drawings & Diagrams	Samples	Certifications (Materials, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
07 24 19 – Exterior Insulation & Finish System	■	■		■			■							■	■	
07 25 13 – Sheet Weather-Resistive Barriers	■		■	■			■								■	■
07 26 13 – Below-Grade Vapor Retarders	■		■	■			■								■	■
07 62 00 – Sheet Metal Flashing and Trim		■		■					■						■	
07 84 00 – Firestopping			■	■			■							■	■	
07 92 10 – Interior Joint Sealants		■		■												
08 12 13 – Standard Hollow Metal Frames	■	■		■					■		■				■	■
08 14 24 – Plastic Laminate-Faced Wood Doors	■	■		■					■		■				■	■
08 31 16 – Access Panels	■			■											■	■
08 34 00 – Special Function Doors	■	■	■	■			■		■					■	■	■
08 42 29.23 – Sliding Automatic Entrances	■	■	■	■			■		■					■	■	■
08 71 00 – Door Hardware	■		■	■			■		■		■			■	■	■
08 81 10 – Interior Glass Glazing		■		■							■			■	■	■
09 05 16 – Preparation of Concrete Substrates for Finish Flooring			■	■											■	
09 22 16 – Lightgauge Metal Framing				■												
09 22 26 – Metal Suspension Systems			■	■		■	■								■	■

Section No. - Title	Shop Drawings & Diagrams	Samples	Certifications (Materials, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
09 28 15 – GMF Gypsum Tile Backing Board				■												
09 29 00 – Gypsum Board				■												
09 30 00 – Tiling	■	■	■	■							■				■	
09 51 13 – Acoustical Panel Ceilings	■	■		■					■						■	
09 65 14 – Resilient Base		■		■					■		■			■	■	■
09 65 16 – Resilient Sheet Flooring	■	■	■	■					■		■			■	■	■
09 81 33 – Acoustical Insulation, Sealants, and Accessories				■												
09 91 00 – Painting Paint Products Schedule		■	■	■	■						■			■		
09 96 56 – Epoxy Coatings		■	■	■	■						■			■		
09 97 23 – Penetrating Concrete Floor Sealer				■												
10 14 13 – Regulatory Signage	■	■		■												
10 22 00 – Partitions (alternative)	■	■	■	■											■	■
10 26 00 – Wall Protection	■	■	■	■										■	■	
10 28 13 – Commercial Toilet Accessories	■			■			■									

Section No. - Title	Shop Drawings & Diagrams	Samples	Certifications (Materials, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
10 44 00 – Fire Protection Specialties	■		■	■			■		■	■	■	■		■	■	
10 44 16 – Portable Fire Extinguisher and Cabinet				■												
12 24 13 – Roller Window Shades	■	■		■										■	■	■
12 36 63 – Solid Surface Material Countertops	■	■	■	■						■				■	■	■
21 13 13 – Wet Pipe Fire Sprinkler System	■		■	■			■		■	■			■	■	■	■
22 05 23.12 – Ball Valves For Plumbing Piping																
22 07 19 – Plumbing Piping Insulation				■			■							■	■	
22 11 16 – Domestic Water Piping				■			■							■	■	
22 11 19 – Domestic Water Piping Specialties	■		■	■			■		■					■	■	
22 13 16 – Sanitary Waste and Vent Piping			■	■			■							■	■	
22 13 19 – Sanitary Waste Piping Specialties			■	■			■		■					■	■	
23 05 17 – Sleeves and Sleeve Seals for Plumbing and HVAC Piping				■												
23 05 18 – Escutcheons for Plumbing and HVAC Piping				■												
23 05 29 – Hangers and Supports for Plumbing and HVAC Piping and Equipment	■		■	■										■		

Section No. - Title	Shop Drawings & Diagrams	Samples	Certifications (Materials, Treatment, Applicator, etc.)	Product Data, Manufacturer' s Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-built Drawings	Others	Guaranty or Warranty	Manufacturer' s Guaranty or Warranty (Greater than one year)
23 05 48 – Vibration and Seismic Controls for Plumbing and HVAC Piping and Equipment			■	■			■							■		
23 05 53 – Identification for Plumbing and HVAC Piping and Equipment				■												
23 05 93 – Testing, Adjusting, and Balancing for HVAC				■												
23 07 13 – Duct Insulation			■	■						■						■
23 07 19 – HVAC Piping Insulation	■			■			■							■	■	
23 09 00 – HVAC Instrumentation and Controls	■			■			■		■	■	■			■		
23 21 13 – Hydronic Piping				■					■					■	■	
23 21 16 – Hydronic Piping Specialties				■					■					■	■	
23 31 13 - Metal Ducts	■		■	■										■	■	
23 33 00 – Duct Accessories	■		■	■		■	■		■		■			■	■	■
23 36 00 – Air Terminal Units	■		■	■		■	■		■	■	■			■	■	■
23 37 13.13 – Air Diffusers				■												■
23 73 13.13 – Indoor Air-Handling Unit	■		■	■		■	■		■	■	■			■	■	■
26 05 00 – Common Work Results for Electrical	■			■										■		
26 05 10 – Basic Electrical Requirements	■			■										■		

Section No. – Title	Shop Drawings & Diagrams	Samples	Certifications (Materials, Treatment, Applicator, etc.)	Product Data, Manufacturer' s Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-built Drawings	Others	Guaranty or Warranty	Manufacturer' s Guaranty or Warranty (Greater than one year)
26 50 00 - Lighting	■			■					■						■	
27 10 00 – Building Telecommunication Cabling System	■		■	■			■							■		
27 52 00 – Healthcare Communications and Monitoring Systems				■												
28 31 00 – Fire Detection and Alarm	■		■	■		■				■				■	■	
31 31 16 – Termite Control			■	■			■									■

END OF SECTION

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. Reference.
- C. Inspection and testing laboratory services.
- D. Special inspections.
- E. Manufacturers' field services and reports.

1.02 RELATED SECTIONS

- A. Section 01330 – Submittal Procedures.
- B. Section 01600 – Product Requirements.

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step-in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Prime Consultant before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 REFERENCES

- A. Conform to reference standard by date of issue current on date for receiving bids.
- B. Obtain copies of standards when required by Contract Documents.

- C. Should specified reference standards conflict with Contract Documents, request clarification from Prime Consultant before proceeding.
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 INSPECTION AND TESTING LABORATORY SERVICES

- A. When the individual specifications sections require it, the Contractor shall coordinate and schedule the hospitals independent firm to perform inspection and testing. Seismic testing will need to be performed by a special inspector. Contractor to coordinate inspection, but KCH will pay for said inspection directly. TAB to be arranged and paid for by the contractor at substantial completion or other date agreed upon by all parties.
- B. Services will be performed in accordance with requirements of governing authorities and with specified standards.
- C. Reports will be submitted by the independent firm to the Prime Consultant, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
 - 1. Notify WHFD AND/OR PROJECT MANAGER and independent firm 24 hours prior to expected time for operations required services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- E. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by WHFD AND/OR PROJECT MANAGER and shall be paid by the Contractor.

1.06 SPECIAL INSPECTIONS

- A. Owner will employ Special Inspectors acceptable to Hawaii County to perform inspection on certain elements of the work as required by the Building Code and its Amendments. During the course of the Work under inspection, each Special Inspector will submit detailed reports relative to progress and conditions of the

work including deviations from specified requirements and stipulating dates, times, and locations. Special inspector will submit a final report to the County, the Contractor and Prime Consultant. The Contractor shall cooperate fully with the Special Inspectors. The Contractor shall be responsible for scheduling of all inspections, including special inspections. The special inspector will send invoices directly to WHFD AND/OR PROJECT MANAGER.

- B. The Hospital will perform and/or pay the fees for the following Special Inspections:
 - 1. Seismic Inspection (if necessary).
 - 2. Structural Inspection.
 - 3. Firestopping inspection.
- C. All other Inspections shall be paid for by the Contractor.

1.07 MANUFACTURER'S FIELD SERVICES AND REPORTS

- A. Submit qualification of observer to the WHFD AND/OR PROJECT MANAGER 30 days in advance of required observations. Observer subject to approval of the Prime Consultant and the WHFD AND/OR PROJECT MANAGER.
- B. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment or to test, adjust, and balance of equipment as applicable, and to initiate instruction when necessary.
- C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written constructions.
- D. Submit two (2) copies of report written by representative, both to the Owner and to the Project Engineer listing observations and recommendations, within five (5) days of observation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01450 - MOISTURE VAPOR AND ALKALINITY TESTING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes additional administrative and procedural requirements for quality assurance.
- B. Scope of Work
 - 1. Provide concrete moisture vapor emission and alkalinity testing of all concrete scheduled to receive floor coverings, Portland cement toppings, Portland cement underlayments or resinous coatings.
 - 2. Review each floor finish manufacturer's instructions for additional requirements pertaining to testing, tolerances, scheduling and distribution of test sites.
 - 3. Test concrete placed below, on and above grade, and in accordance with the manufacturer's requirements.
 - 4. Test ALL CONCRETE SURFACES scheduled to receive new floor finish, paint or coatings.
 - a. Test existing concrete surfaces.
 - b. Test new concrete surfaces, including patch areas such as concrete placed over trenches.

1.02 RELATED SECTIONS

- A. Section 03 54 16 - Hydraulic Cement Underlayment
- B. Section 09 05 16 - Preparation of Concrete Substrates for Finish Flooring
- C. Section 09 65 16 – Resilient Sheet Flooring.
- D. Section 09 91 00 - Painting.
- E. Section 09 96 56 – Epoxy Coatings

1.03 REFERENCES

- A. ASTM F 1869 - Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

- B. ASTM F 710 - Standard Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

1.04 SUBMITTALS

- A. Testing Agency qualifications.
- B. Report all test results in chart form listing test dates, start/stop time, start/stop weight, weight gain in grams, moisture vapor emission value and alkalinity levels.
- C. List test locations on chart and show same on a site map, floor plan or other plan materials so that test locations are accurately known.
- D. Deliver test results to the WHFD AND/OR PROJECT MANAGER and Prime Consultant.

1.05 QUALITY ASSURANCE

- A. Independent Testing Agency or Manufacturer's Approved Contractor
 - 1. Certified by Test Kit Manufacturer for product use.
 - 2. Other agency with verifiable experience.
- B. Commercially produced Moisture Vapor Emission Test Kits
 - 1. Test dish including calcium chloride must be commercially packaged and delivered to test site in sealed factory wrapping.
 - 2. Test done from same source as dish.
 - 3. Test kit must comply with ASTM standards of size and weight.
- C. Wide range pH paper, and distilled or de-ionized water.

1.06 ENVIRONMENTAL CONDITIONS

- A. Testing shall take place after allowing concrete to dry for a minimum of 90 days. Testing to be scheduled no less than 1 nor more than 3 weeks prior to scheduled flooring installation.
- B. Testing shall be in accordance with the manufacturer's requirements for each floor finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Calcium Chloride Test as manufactured by Vaprecision (800) 449-6194, or equal.
- B. Alkalinity test paper as manufactured by Micro Essential Laboratory, or equal.

PART 3 - EXECUTION

3.01 QUANTIFICATION OF CONCRETE MOISTURE VAPOR EMISSION

- A. Test concrete floors in accordance with ASTM F 1869.
- B. The test site shall be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperatures and humidity levels shall be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions shall be 75+ 10 degrees F and 50+ 10 percent relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
- C. The number of vapor emission test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 in the first 600 square feet and one per each additional 200 square feet. For slabs on grade, locate additional tests adjacent to penetrations and through slab joints at the rate of one per 200 square feet.
- D. Tests sites are to be cleaned of all adhesive residue, curing compounds, paints, sealers, floor coverings, and similar materials 24 hours prior to the placement of test kits.
- E. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 gram. Record weight and start time.
- F. Expose Calcium Chloride and set dish on concrete surface.
- G. Install test containment dome and allow test to proceed for 60 - 72 hours.
- H. Retrieve test dish by carefully cutting through containment dome. Close and reseal test dish.

- I. Weigh test dish on site recording weight and stop time.
- J. Calculate and report results as “pounds of emission per 1,000 square feet per 24 hours”.

3.02 QUANTIFYING ALKALINITY LEVEL

- A. Test concrete floors in accordance with ASTM F 710.
- B. At each vapor emission test site, after removal of test containment dome, perform alkalinity test.
 - 1. Place several drops of water onto the concrete surface to form a puddle approximately one-inch in diameter.
 - 2. Allow the water to set for approximately 60 seconds.
 - 3. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine alkalinity reading.
- C. Record and report all results.

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities may include, but not limited to, the following:
 - 1. Sewers and drainage.
 - 2. Water service and distribution.
 - 3. Sanitary facilities, including toilets, wash facilities and drinking water facilities.
 - 4. Electric power service.
 - 5. Lighting.
 - 6. Telephone service.
- C. Support facilities include, but are not limited to, the following:
 - 1. Project identification and temporary signs.
 - 2. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities may include, but are not limited to, the following:
 - 1. Environmental protection.
 - 2. Storm water control.
 - 3. Tree and plant protection.
 - 4. Pest control.
 - 5. Site enclosure fence.
 - 6. Security enclosure and lockup.
 - 7. Barricade, warning signs, and lights.
 - 8. Fire protection.

1.02 RELATED DOCUMENTS

- A. Refer to Drawings for additional requirements for temporary protection.

1.03 RELATED SECTIONS

- A. Section 01330 – Submittal Procedures.

1.04 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to WHFD AND/OR PROJECT MANAGER. Manager change over from use of temporary service to use of permanent service.
 - 1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
 - 1. Keep temporary services and facilities clean and neat.
 - 2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- B. Water: Potable

2.02 EQUIPMENT

- A. Fire Extinguishers: Hospital will provide fire extinguishers. Hand carried, portable, UL rated. Provide class and extinguishing agents as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

- B. Self-Contained Toilet units, if necessary Single occupant units of chemical, aerated recirculation or combustion type; vented; fully enclosed with a glass- fiber-reinforced polyester shell or similar non-absorbent material.
- C. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- D. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V AC, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Engage appropriate local utility company to install temporary service or connect to serve connections provided under the Work of the Project. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
 - 1. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
 - 2. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
 - 3. Install 50 amp 125/250v job box, if necessary.
 - 4. Sewers and Drainage: If sewers are available, provide temporary

connections to remove effluent that can be discharged lawfully.

- B. Water Service: Connect to existing water source for construction operations.
- C. Sanitary Facilities: Existing designated facilities may be used during construction operations. Maintain daily in clean and sanitary condition,
- D. Electric Power Service: Connect to existing power service. Power consumption shall not disrupt hospital's need for continuous service.
- E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

3.03 SUPPORT FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulation and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Cooperate and comply with hospital's Environmental Management Plan.
- B. Noise Control:
 - 1. Obtain noise permit or permit as required by Chapter 43 State of Hawaii Department of Health regulations.
 - 2. Muffle internal combustion engine powered equipment to minimize noise and properly maintain to reduce noise to acceptable levels.
 - 3. Blasting and use of explosives will be not permitted.
 - 4. Activities of severe and prolonged noise and vibration must be approved in advance by WHFD AND/OR PROJECT MANAGER. Submit written notice not less than seven days in advance of intended noise producing activity.
- C. Dust Control:
 - 1. Keep dust within acceptable levels at all times, including non-working hours, weekends and holidays, in conformance with Chapter 31 – Air Pollution of State Departments of Health, Public Health Regulations, latest editions.
 - 2. Only wet grinding or cutting of concrete will be allowed on exterior surfaces.
 - 3. Mechanical dry sweeping not permitted. Vacuuming, wet mopping, approved

limited dry hand, wet or damp sweeping is acceptable utilizing the hospital's EPA approved disinfectant.

4. During loading operations, water down debris and waste materials to allay dust.
 5. Air scrubbers utilized for dust control costs incurred are the responsibility of the Contractor.
 6. Use wet/sticky mats at all entrances to work area to control dust. Replace daily at a minimum.
 7. The Contractor is responsible for damage claims.
 8. ICRA – during construction/renovation – KCH Policy 125.54 must be adhered to.
- D. Hazardous materials:
1. Asbestos, urea formaldehyde and other hazardous materials are not expected but may be present in the existing structures subject to alteration. Observe the applicable requirements of Hawaii Occupational Safety and health Standards and the Environmental Protection Agency.
 2. If the presence of toxic substances is determined, notify the WHFD AND/OR PROJECT MANAGER immediately to determine the next course of action.
 3. Do not begin demolition when toxic substances are present until occupants of the building are moved to other facilities or are separated from the exposure by assured means.
 4. In removing and disposing of toxic substances, observe the following requirements:
 - a. Provide air-tight compartments within which the toxic substances may be removed.
 - b. In lieu of air-tight compartments, provide competent controlled misting or dust settling agent.
 - c. Place toxic substances in properly labeled sacks of at least 8 mil polypropylene.

5. Must adhere to KCH Hazmat Material and Waste Management Program Policy 122-6 and Cleanup of Spills, Hazardous and Infectious Policy 122-6-2. (If any differences are discovered between RFP and KCH policies, KCH policies shall prevail.)
- E. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Hospital will provide fire extinguishers.
 - a. Field Offices: Class A stored-pressure water-type extinguishers.
 - b. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposed areas.
 4. Supervise welding operations, and similar sources of fire ignition.
 5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
 6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedure to be followed. Instruct personnel in methods and procedures. Post warnings and information.
- F. Barriers
1. Follow ICRA. Provide barriers to prevent unauthorized entry to construction areas, to allow for hospital's use of premises, and to protect existing facilities and adjacent properties from damage from construction operations.

2. Provide barricades and covered walkways required by governing authorities.
3. Protect non-owned vehicular traffic, store materials, site and structures from damage.
4. Barriers that will be used on project are to be approved by the project manager before starting work.

G. Interior Enclosures

1. Provide temporary partitions as required to separate work areas from hospital occupied areas, to prevent penetration of dust and moisture into hospital occupied areas, and to prevent damage to existing materials and equipment.
2. Construction: Framing and sheet materials must be noncombustible, with closed joints and sealed edges at intersections with existing surfaces and all other areas to provide a smoke tight area; STC rating of 35 in accordance with ASTM E90 and maximum Flame Spread Rating of 75 in accordance with ASTM E84. This information must be posted on the containment.
3. Paint surfaces exposed to view from hospital occupied areas.
4. Enclosures that will be used on the project are to be approved by the WHFD AND/OR PROJECT MANAGER before starting work.

H. Infection Control

1. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with hospital's infection control regulation and minimize undesirable effects.
 - a. For ICRA. Cooperate and comply with Owner's Infection Control Plan (KCH Infection Control, Policy 125-54, to be adhered to during construction and renovation.).

3.04 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended use.

- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

END OF SECTION

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Selection of products for use in project
- B. Product delivery, storage, and handling
- C. Manufacturers standard warranties on products; special warranties
- D. Product substitutions
- E. Comparable products

1.02 RELATED SECTIONS

- A. Section 01330 – Submittal Procedures.
- B. Section 01400 – Quality Requirements.
- C. Section 01770 – Closeout Procedures.
- D. Section 01732 – Cutting and Patching.

1.03 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term “product” includes the terms “material,” “equipment,” “system,” and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer’s product name, including make or model number or other designation, shown or listed in manufacturer’s published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled- content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service

performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design." including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Hospital.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Hospital.

1.04 SUBMITTALS

- A. Product List: Submit a list, in tabular form (preferably in Microsoft Excel), showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.

- f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
3. Initial Submittal: Within 20 days after date of commencement of the Work, submit electronically the initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
- a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
4. Completed List: Within 30 days after date of commencement of the Work, submit electronically the completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Project Prime Consultant's or WHFD AND/OR PROJECT MANAGER's Action: The Project Prime Consultant or WHFD AND/OR PROJECT MANAGER will respond in writing to Contractor within 15 days of receipt of completed product list. The Project Prime Consultant's or WHFD AND/OR PROJECT MANAGER's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Project Prime Consultants or WHFD AND/OR PROJECT MANAGERS response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01330 - Submittal Procedures. Show compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, the WHFD AND/OR PROJECT MANAGER will determine which products shall be used.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturers written instructions.
 1. Schedule delivery to minimize storage at Project site and to prevent overcrowding of construction spaces. Long term storage onsite is not permitted unless approved by WHFD AND/OR PROJECT MANAGER.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. Store products to allow for inspection and measurement of quantity or counting of units.
 6. Store materials in a manner that will not endanger Project structure.
 7. Store products that are subject to damage by the elements, under cover in a weather-tight enclosure above ground, with ventilation adequate to prevent condensation.
 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 9. Protect stored products from damage
- B. Storage: Provide a secure location and enclosure at Project site for temporary storage of materials and equipment. Coordinate location with WHFD AND/OR

PROJECT MANAGER. Long term storage onsite is not permitted unless approved by WHFD AND/OR PROJECT MANAGER.

1.07 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
 - 3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01770 - Closeout Procedures.

PART 2 - PRODUCTS

2.01 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents that are undamaged, and unless otherwise indicated, that are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Hospital reserves the right to limit selection to products with warranties not in

conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term “match sample,” sample to be matched is Prime Consultant’s.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics” of products.
 6. Or Equal: Where products are specified by name and accompanied by the term “or equal” or “or approved equal” or “or approved,” comply with provisions in “Comparable Products” Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled “Product” name a single product and manufacturer, provide the product named.
 - a. Substitutions may be considered, unless otherwise indicated.
 2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled “Manufacturer” or “Source” name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 3. Products: Where Specification paragraphs or subparagraphs titled “Products” introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 4. Manufacturers: Where Specification paragraphs or subparagraphs titled “Manufacturers” introduce a list of manufacturers’ names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 5. Available Products: Where Specification paragraphs or subparagraphs titled “Available Products” introduce a list of names of both products and manufacturers, provide one of the products listed or another product that

complies with requirements. Comply with provisions in “Comparable Products” Article to obtain approval for use of an unnamed product.

6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled “Available Manufacturers” introduce a list of manufacturer names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in “Comparable Products” Article to obtain approval for use of an unnamed product.
7. Product Options: Where Specification paragraphs titled “Product Options” indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in “Product Substitutions” Article.
8. Basis-of-Design Products: Where Specification paragraphs or
9. subparagraphs titled “Basis-of-Design Product[s]” are included and also introduce or refer to a list of manufacturers’ names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in “Comparable Products” Article to obtain approval for use of an unnamed product.
 - a. Substitutions may be considered, unless otherwise indicated.
10. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Prime Consultant’s sample. WHFD AND/OR PROJECT MANAGER’s or Contract Manager’s decision will be final on whether a proposed product matches satisfactorily.
 - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on “substitutions” for selection of a matching product.
11. Visual Selection Specification: Where Specifications include the phrase “as selected from manufacturer’s colors, patterns, textures” or a similar phrase,

select a product (and manufacturer) that complies with other specified requirements.

- a. Standard Range: Where Specifications include the phrase “standard range of colors, patterns, textures” or similar phrase, WHFD AND/OR PROJECT MANAGER and Contracts Manager will select color, pattern, or texture from manufacturer’s product line that does not include premium items.
- b. Full Range: Where Specifications include the phrase “full range of colors, patterns, textures or similar phrase. WHFD AND/OR PROJECT MANAGER and Contracts Manager will select color, pattern, or texture from manufacturer’s product line that includes both standard and premium items.

12. Allowances: Refer to individual Specification Sections and “Allowance” provisions in Division I for allowances that control product selection and for procedures required for processing such selections.

2.02 PRODUCT SUBSTITUTIONS

- A. Follow the procedures as described in Hawaii Health Systems Corporation General Conditions for Construction.

2.03 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
 1. Provide evidence that the proposed product does not require extensive revisions to the Contract Documents.
 2. Provide evidence that the proposed product is consistent with the intent of the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 3. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 4. Provide evidence that proposed product provides specified warranty.

5. List of similar installations for completed projects with project names and addresses and names and addresses of Prime Consultants and owners, if requested.
6. Samples, if requested.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01730 – EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction layout.
- B. Field engineering and surveying.
- C. Progress cleaning.

1.02 RELATED SECTIONS

- A. Section 01330 – Submittal Procedures.
- B. Section 01770 – Closeout Procedures.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Acceptance of Conditions: Examine substrates, areas, and conditions, with General Contractor and Subcontractor present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of Items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Prime Consultant. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.03 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
- B. Site: Maintain Project site free of waste materials and debris.

- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, wet mop or vacuum the entire work area, as appropriate, utilizing the hospital's EPA approved disinfectant.
- D. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- E. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

END OF SECTION

SECTION 01732 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching of Work.

1.02 RELATED SECTIONS

- A. Section 01100 - Summary of Work.
- B. Section 01120 – Alteration Project Procedures.
- C. Section 01330 – Submittal Procedures.
- D. Section 01600 – Product Requirements.
- E. Section 07 84 00 – Firestopping.
- F. Individual Product Specification Sections:
 - 1. Cutting and patching incidental to work of the Section.
 - 2. Advance notification to other Sections of openings required in work of those Sections.
 - 3. Limitations on cutting structural members.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Primary Products: Those required for original installation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing work, inspect conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas that may be exposed by uncovering work.
- C. Maintain excavations free of water.

3.03 CUTTING AND PATCHING

- A. Execute cutting, fitting, and patching to complete work.
- B. Fit products together to integrate with other work.
- C. Uncover work to install ill-timed work.
- D. Remove and replace defective or non-conforming work.
- E. Remove samples of installed work for testing when requested.
- F. Provide openings in the work for penetration of mechanical and electrical work.

3.04 PERFORMANCE

- A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- B. Cut rigid materials using masonry saw or core drill. Pneumatic tools are allowed with WHFD's prior approval.
- C. Restore work with new products in accordance with requirements of Contract Documents.
- D. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- E. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids, firestopping, to full thickness of the penetrated element. See Section 07 84 00 – Firestopping.
- F. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.

1.02 RELATED SECTIONS

- A. Section 01260 - Contract Considerations.
- B. Section 01290 - Payment Procedures.
- C. Section 01310 – Project Management and Coordination.
- D. Section 01600 – Product Requirements.
- E. Section 01730 - Execution Requirements.
- F. Section 01783 – Project Record Documents.
- G. Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Hospital Risk Manager of pending insurance changeover requirements, if necessary.
 - 3. Obtain and submit releases permitting Hospital unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating

certificates, and similar releases.

4. Prepare and submit Project Record Documents, marked-up hardcopy of the Record Drawings, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 5. Complete startup testing of systems.
 6. Submit test/adjust/balance, including TAB, records.
 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 8. Advise WHFD AND/OR PROJECT MANAGER of changeover in heat and other utilities.
 9. Submit changeover information related to Hospital's occupancy, use, operation, and maintenance.
 10. Complete final cleaning requirements, including touchup painting.
 11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, the WHFD AND/OR PROJECT MANAGER will either advise the Prime Consultant to proceed with inspection or notify Contractor of unfulfilled requirements. Upon request from the WHFD AND/OR PROJECT MANAGER, the Prime Consultant will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by the WHFD AND/OR PROJECT MANAGER that must be completed or corrected before the certificate will be issued.
1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.04 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Section 01290 - Payment Procedures.
 2. Submit warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents. To be submitted in 3 ring binder.
 3. Submit operation and maintenance manuals. To be submitted in a 3 ring binder.
 4. Deliver tools, spare parts, extra materials, and similar items to location designated by WHFD AND/OR PROJECT MANAGER. Label with manufacturer's name and model number where applicable.
 5. Make final changeover of permanent locks and deliver keys to WHFD AND/OR PROJECT MANAGER. Advise Hospital's personnel of changeover in security provisions.
 6. Submit copy of WHFD AND/OR PROJECT MANAGER's Substantial Completion inspection list of items to be completed or corrected. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 8. Instruct Hospital's personnel in the operation, adjustment, and maintenance of products, equipment, and systems. Document attendance and discussion topics presented to WHFD AND/OR PROJECT MANAGER's personnel.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, the Prime Consultant and WHFD AND/OR PROJECT MANAGER will either proceed with inspection or notify Contractor of unfulfilled requirements.
1. Re-inspection: Request re-inspection when the Work identified in previous

inspections as incomplete is completed or corrected.

1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit electronic copy of punch list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use Contractor's form.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Contractor.
 - d. Page number.

1.06 WARRANTIES

- A. Submittal Time: Submit written warranties on request of WHFD AND/OR PROJECT MANAGER for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 10 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11 1-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Cleaning agents must be approved WHFD AND/OR PROJECT MANAGER. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions as well as utilize hospital approved disinfectants.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- g. Sweep concrete floors broom clean in unoccupied spaces. Mop using quaternary ammonium disinfectants.
- h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- i. Clean transparent materials, including mirrors and glass in doors and windows, Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- j. Remove labels that are not permanent.
- k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - i. Do not paint over "UL" and similar labels on doors, door frames, windows and window frames, including mechanical and electrical nameplates. If "UL" and similar labels are painted over, the Contractor will need to replace the assemblies.

- l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to unusual operating conditions.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Pest Control: To be determined by WHFD AND/OR PROJECT MANAGER.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Hospital's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully. Follow County of Hawaii waste guidelines.

END OF SECTION

SECTION 01783 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.

1.02 RELATED SECTIONS

- A. Section 01770 - Closeout Procedures.
- B. Related sections of the work in this Specification for Project Record Documents.

1.03 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal: Submit one set of marked-up Record Prints. Prime Consultant will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Prime Consultant will return plots and prints for organizing into sets, printing, binding, and final submittal.
 - b. Final Submittal: Submit one set of marked-up Record Prints and print each Drawing, whether or not changes and additional information were recorded.
 - i. E-mail: PDF formats
 - c. Record Specifications: Submit one electronic copy of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

- A. Record Prints: Maintain one set of black-line prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Accurately record information in an understandable drawing technique.
 - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Prime Consultant's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.

- n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Contractor.

2.02 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.03 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders. Record Specifications, and Record Drawings where applicable.

2.04 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Prime Consultant's and Owner's reference during normal working hours.

END OF SECTION

DIVISION 02

EXISTING CONDITIONS

SECTION 02 41 20 – SELECTIVE BUILDING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Systematic removal of portions of buildings and structures.
2. Salvage of existing items for reuse.
3. Salvage of construction materials for recycling.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Remove: Means to detach from existing construction and legally dispose off-site.
2. Demolish: Means the same as “remove”.
3. Dispose: Means to get rid of by throwing away; or by giving or selling to someone else.
4. Reuse: Means to use again for the same function without re-processing.
5. New-Life Reuse: Means to use again for a different function without re-processing.
6. Remove and Salvage: Means to detach from existing construction, prepare for reuse or storage as applicable, and then deliver to the Owner.
7. Remove and Reinstall: Means to detach from existing construction, prepare for reuse, and reinstall where indicated.
8. Recycle: Means to detach from existing construction, break down into raw materials, and then process the materials to make new items.
9. Existing-to-Remain: Means existing items that are not removed, reused, or recycled.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Demolition drawings are diagrammatic and show existing conditions with information developed from field surveys and to generally show the extent and type of demolition required. The Owner will maintain conditions existing at the time of inspection for bidding purposes as far as practicable.

1. Before beginning demolition, make a detailed survey of existing conditions indicated below in Part 3 of this specification Section, and report discrepancies or conflicts between Drawings and actual conditions in writing to the Architect for clarifications and instructions.

2. Do not proceed, when such conflicts or discrepancies occur, before receipt of the Architect's instructions.

B. Pre-Demolition Meeting:

1. To review methods and procedures related to the work of this specification Section, hold a meeting at the project site after submittal approval and at least 10 business days before beginning installation. At a minimum, the Contractor, demolition subcontractor, and Architect must attend the meeting.
2. During the meeting, review the Contract Documents, submittals, project conditions, and demolition sequence and methods, including special details and conditions that might affect demolition.
 - a. Review and discuss existing conditions survey indicated below in Part 3 of this specification Section.
 - b. Inspect and discuss condition of construction to be selectively demolished.
 - c. Review structural load limitations of existing structure.
 - d. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - e. Review requirements of work that rely on substrates exposed by selective demolition operations.
 - f. Review areas where construction is existing-to-remain and requires protection.
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting or demolishing construction. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin demolition until disagreements are successfully resolved to the satisfaction of all parties.

1.4 SUBMITTALS

A. Informational Submittals:

1. Schedule of Selective Demolition Activities: Indicate the following.
 - a. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - b. Interruption of utility services. Indicate how long utility services will be interrupted.
 - c. Coordination for shutoff, capping, and continuation of utility services.
 - d. Use of elevator and stairs.
 - e. Locations of proposed dust- and noise-control temporary partitions and means of egress.
 - f. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed work.
 - g. Means of protecting existing-to-remain items in the path of waste removal.

2. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
3. Pre-Demolition Photographs or Videos: Submit videos or photographs showing existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations.

1.5 QUALITY ASSURANCE

- A. Quality Standards: Comply with the safety requirements of both American National Standards Institute/ American Society of Safety Engineers publication ANSI/ASSE A10.6. *"Safety Requirements for Demolition Operations"* and National Fire Protection Association publication NFPA 241, *"Standard for Safeguarding Construction, Alteration, and Demolition Operations"*.

1.6 PROJECT CONDITIONS

- A. Hazardous Materials: Hazardous materials may be encountered in the building or at the project site. If materials suspected of containing hazardous materials are encountered, then do not disturb; promptly notify the Architect and Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure adequate supervision practices are followed at the project site before demolition work begins and at all times during installation.
- B. Survey: Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
 1. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
 2. Provide means to have digital molds created to repair ornate items in case of loss (e.g., laser cloud point scan).
 3. Inventory and record the condition of items removed and reinstalled and removed and salvaged.
 4. When unforeseen mechanical, electrical, or structural elements are encountered that conflict with intended function or design, investigate and measure the nature and extent of conflict. Promptly submit written report to Architect.

5. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.2 PREPARATION

- A. Site Protection: Protect existing-to-remain sitework against damage and soiling during demolition.
 1. Do not begin selective demolition work until temporary partitions, barricades, warning signs, and other forms of protection are installed.
 2. Protect trees, plants, utilities, and existing improvements that are not to be removed from injury or damage. Replace damaged landscaping, improvements, and utilities in kind.
 3. During demolition, provide safeguards for protection of the public, Contractor's employees, and existing improvements existing-to-remain, including warning signs and lights, barricades, and the like.
 4. Provide and maintain shoring, bracing, and structural supports required to preserve stability and prevent movement, settlement, or collapse of existing-to-remain construction and finishes; and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- B. Building Protection: Protect existing-to-remain building construction against damage and soiling during selective demolition.
 1. Do not begin selective demolition work until temporary building bracing, barricades, and other protection necessary to prevent injury to people and damage to adjacent existing-to-remain facilities.
 2. Do not allow water to enter existing-to-remain wall or roof insulation. Replace insulation when it is wetted.
- C. Utilities, Services, and Building Systems Protection:
 1. Maintain existing-to-remain utility services and mechanical and electrical systems and protect them against damage during selective demolition operations.
 2. Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical and electrical systems serving areas indicated for demolition.
 - a. Arrange with utility companies to shut off indicated utilities.
 - b. If building systems or mechanical and electrical systems are indicated as removed, relocated, or abandoned, provide temporary services and systems that bypass demolition areas and maintain continuity of services and systems to other parts of building before proceeding with selective demolition.
 - c. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.3 DEMOLITION

- A. General Demolition Requirements:

1. Coordinate demolition to assure the proper sequence, limits, methods, and time of performance. Schedule demolition to impose minimum of hardship on present facility operations and performance of the work.
2. Conduct selective demolition and debris-removal operations to ensure the least interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
3. Demolish and remove existing construction only as shown and to the extent required by new construction. Use methods necessary to complete the work within indicated or specified limitations.
 - a. Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not shown as demolished; do not demolish existing construction beyond indicated limits.
 - b. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not shown as demolished.
 - c. Do not demolish existing construction beyond indicated limits.
4. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage existing-to-remain construction or adjoining construction.
5. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces.
6. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces. Verify condition and contents of hidden space before starting cutting operations.
7. Do not use cutting torches until after work areas are cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
8. Temporarily cover existing-to-remain openings.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Do not remove any item in a manner that that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Removed and Salvaged Items:
 - a. Clean salvaged items.
 - b. Pack or crate items after cleaning. Identify contents of containers.
 - c. Store items in a secure area or location until delivery to the Owner.
2. Removed and Reinstalled Items:
 - a. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - b. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - c. Protect items from damage during transport and storage.

- d. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- 3. Existing-to-Remain Items:
 - a. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 CORRECTION AND REPAIR

- A. Damaged existing-to-remain work must be patched and repaired. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 - 1. written descriptions of non-conforming, damaged, and defective work;
 - 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 - 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Do not correct, repair, or replace any item in a manner that that results in any warranty or guarantee becoming void.
- D. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Except for recycled, reused, salvaged, and reinstalled items and other existing-to-remain items on Owner's property, remove demolished materials from the project site and legally dispose off-site. Do not burn demolished materials.
- B. Removed items not indicated for reuse, reinstallation, or salvage are the property of the Contractor and must be cleared from the project site.
 - 1. Continuously clean up and clear these items; do not allow them to accumulate in the building or at the project site.
 - 2. Material and equipment may not be viewed by prospective purchasers nor sold on the site.
 - 3. The Owner is not responsible for the condition, loss, or damage to removed items.
- C. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

OUTPATIENT ONCOLOGY CLINIC
KONA COMMUNITY HOSPITAL
BIDDING DOCUMENTS

KYA INC.
PROJECT NO. 23043.00
04/05/2024

END OF SECTION

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DIVISION 03

CONCRETE

SECTION 03 54 16 – HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydraulic cement underlayment.
2. Patching material.
3. Surface preparation.
4. Installation materials.
5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 05 16 for preparation of concrete slabs for finish flooring; and for remedial MVER products.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the cement underlayment manufacturer, unless otherwise indicated.
2. Underlayment: Means a material installed over subfloors to help achieve specified floor flatness values, and to smooth and correct surface irregularities prior to flooring installation

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify chemical and adhesive compatibility of selected cement underlayment with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.
2. Proposed substitution requests and submittals that change the quality (grade) or the generic chemistry of specified cement underlayment are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
3. Coordinate existing concrete subfloor surface flatness and levelness with ACI 117 requirements, measured in conformance with ASTM E 1155 (3D laser scanning or Allen Face F-Meter methods), and tolerances required, recommended, or accepted by the cement underlayment manufacturer.

4. Coordinate cement underlayment primers with concrete curing compounds.
 - a. When accepted in writing by the manufacturer's field representative, specified cement underlayment may be applied over concrete slabs treated with either a silicate or acrylic resin curing compound.
 - b. Wax- and petroleum-based emulsions are permanent bond breakers that must be completely removed by mechanical means prior to patching or leveling.
 - c. Dissipating compounds must be completely removed by mechanical means prior to patching or leveling.
 - d. In all cases, acid etching, adhesive removers, solvents, and sweeping compounds are prohibited.
 5. When covering plywood or OSB subfloor sheathing with cement underlayment, additional measures must be taken to avoid concrete topping or concrete mix water leaching into subflooring. (concrete topping and concrete toppings seal the upper surface and moisture must travel through the full depth of subflooring to escape, which may delay ceiling finish installation to avoid trapping moisture within the assembly)
 6. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
 - a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead;
 - b. assume the manufacturer-recommended coverage rates govern; and
 - c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.
- B. Sequencing:
1. Install cement underlayment only after concrete is cured to a condition of equilibrium; is sufficiently dry to bond with cement underlayment; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible surface treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
 2. Install cement underlayment only after penetrating items are installed.
- C. Scheduling:
1. Concrete Substrate Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
 2. Primer Installation: Cement underlayment must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
 3. Finishing Flooring Installation: Do not install floor coverings until after the minimum time recommended in writing by the manufacturer has passed.
 4. Access Restrictions: Close spaces during installation; keep closed to foot traffic after installation for at least 48 hours and to rolling load traffic for at least 72 hours.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 - 1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 - 1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished cement underlayment.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 - 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Cement underlayment must be obtained through one source from the same manufacturer (to ensure compatibility and a warrantable installation).
 - a. Certain cement underlayments may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 - 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Qualifications:
 - 1. Installer: Company or individuals must have at least 5 years' experience installing cement underlayment for at least 30 previous projects similar to this project in size, material, design, and complexity.
 - 2. Supervisors: Individuals must have at least 7 years' experience installing cement underlayment for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading cement underlayment installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 - 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 - 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.
 - 1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
 - 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 - 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 - 4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
 - 1. Avoid damage to packaging and containers, and contamination of contents.
 - 2. Rotate inventory; do not use items the shelf life of which is expired.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective cement underlayment materials with undamaged new cement underlayment materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install cement underlayment only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
- B. Existing Conditions:
 - 1. Surface Conditions: Install cement underlayment only when substrate moisture content, vapor emission rate, and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide products manufactured by one of the following, or equal.
1. ARDEX Group.
 2. Custom Building Products.
 3. Floor Seal Technology, Inc.
 4. LATICRETE International, Inc.
 5. Mapei Corp.

2.2 HYDRAULIC CEMENT UNDERLAYMENT

- A. Description: Portland-cement-based, non-structural, engineered cementitious material specifically designed for use as interior flooring cement underlayment. Products with added gypsum are prohibited.
- B. Application: Installed over subfloors to help achieve specified floor flatness values; and to smooth and correct surface irregularities prior to flooring installation.
- C. Self-Leveling Products:
1. Pourable Grade Cement Underlayment Applications (0 to 1-1/4 inches thick):
"ARDEX V-1200" self-leveling, no-troweling cement underlayment manufactured by ARDEX Americas, or equal. Primer is required.
 2. High-Flow Cement Underlayment Applications (1/16- to 1/2-inch thick):
"ARDEX K 10" reactivatable high-flow, self-leveling cement underlayment manufactured by ARDEX Americas, or equal. Primer is required.
 3. Thicker Cement Underlayment Applications (1/4-inch to 5 inches thick):
"ARDEX K 15" self-leveling polymer-modified cement underlayment manufactured by ARDEX Americas, or equal. Primer is required.
 - a. For application thickness between 1/4-inch and 1-1/2 inches thick, apply neat.
 - b. For application thickness between 1-1/2 and 5 inches thick, apply with aggregate.
 4. Fiber Reinforced Underlayment Applications (1/4-inch to 5 inches thick):
"ARDEX K 22 F" high-flow, fiber-reinforced, self-leveling underlayment manufactured by ARDEX Americas, or equal. Primer is required.
 - a. For application thickness between 1/4-inch and 1-1/4 inches thick, apply neat.
 - b. For application thickness between 1-1/4 and 2 inches thick, apply with aggregate.
- D. Trowel Grade Products:
1. Non-Structural Repair, Re-Slope, and Re-Forming Material: "ARDEX CP" Portland cement-based concrete topping for filling and repairing indoor and outdoor concrete flatwork manufactured by ARDEX Americas, or equal.

2. Structural Repair Mortar: "ARDEX ERM" Polymer modified structural repair mortar with integral corrosion inhibitor manufactured by ARDEX Americas, or equal.

2.3 PATCHING MATERIAL

- A. Patching Compound: "ARDEX SD-F Feather Finish" self-drying finishing cement underlayment manufactured by ARDEX Americas, or equal. Primer is typically not required.

2.4 SURFACE PREPARATION

- A. Substrate Testing and Surface Preparation: Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16.
- B. Concrete Surface Profiling: Provide ICRI concrete surface profile CSP 3 to CSP 5 (light to medium shotblast between 10 and 40 mils), unless otherwise explicitly required, recommended, or accepted in writing by the covering manufacturer. Conform to the requirements of Section 09 05 16.

2.5 INSTALLATION MATERIALS

- A. Primers:
 1. Standard Absorbent Concrete, Gypsum, and Other Porous Substrates (in Specialized Applications): "ARDEX P 51" manufactured by ARDEX Americas, or equal.
 - a. Two applications of primer must be applied over gypsum cement underlayment.
 - b. Two applications of primer may be required over absorbent concrete cement underlayment.
 2. Wood, Cutback Residue, Metal, and Other Non-Porous Substrates: "ARDEX P 82 ULTRA PRIME" manufactured by ARDEX Americas, or equal.
- B. Additive: "ARDEX E 25" resilient emulsion manufactured by ARDEX Americas, or equal, for use over cutback and other adhesive residues on concrete subfloors only; over metal; and as part of mesh-reinforced wood subfloor systems.
- C. Crack Repair Compound: "ARDEX ARDIFIX" 100-percent solids, 2-part polyurethane repair compound manufactured by ARDEX Americas, or equal, for repair of non-moving joints and cracks.
- D. Joint Filler: "ARDEX ARDISEAL Rapid Plus" 2-part, self-leveling, semi-rigid polyurea joint filling compound manufactured by ARDEX Americas, or equal, for repair of all moving joints.
- E. Sand: Washed masonry or plaster sand, 1/8-inch diameter and smaller.
- F. Aggregate: Well-graded washed gravel, 1/8- to 1/4-inch diameter or larger, supplied, required, recommended, or accepted by the manufacturer for proposed thicknesses.

- G. Mix Water: Provide fresh, clean, clear, potable water from a domestic source. Water must conform to ASTM C 1602 and be free of oil, grease, waxy films, curing compounds, release agents, and other deleterious materials, including salts, acids, alkalis, organic materials, detergents, and other matter that might negatively affect cement underlayment quality, durability, or performance.

2.6 ACCESSORIES

- A. Perimeter Isolation Strips: Supplied, required, recommended, or accepted by the manufacturer.
- B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.7 MIXING

- A. Site Mixing: Batch mix cement underlayment in conformance with manufacturer's instructions and other requirements and recommendations, using manufacturer-recommended techniques and manufacturer-recommended mechanical mixing equipment, which must be clean and free of material from previously mixed batches before charging each subsequent batch.
 - 1. Measure mix materials using only graduated mixing containers and calibrated mixing equipment. Shovels do not qualify as graduated mixing containers or calibrated equipment and are prohibited from measuring or dispensing mix materials.
 - 2. Thoroughly agitate and stir mix materials to a uniform and smooth consistency suitable for proper installation.
 - 3. Do not reduce, alter, or introduce foreign materials into mix materials, , including primers, additives, compounds, and fillers, except in conformance with manufacturer's instructions and other requirements and recommendations.
 - 4. Do not use caked or lumpy materials; or materials that are irregular, too thick or too thin, or that are partially set.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 - 1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.

2. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with cement underlayment adhesion or performance.
4. Verify items penetrating cement underlayment are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage; and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
2. Opening Protection: Close and protect drains and other openings and penetrations to prevent cement underlayment intrusion or migration.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

1. Remove substrate coatings and other substances that are incompatible with cement underlayment or that may negatively affect the quality of installation, durability, or performance.
2. Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16. Provide ICRI concrete surface profile CSP 3 to CSP 5 (light to medium shotblast between 10 and 40 mils), unless otherwise explicitly required, recommended, or accepted in writing by the manufacturer.
3. Repair damaged sub-floor and fill cracks.
4. Vacuum-clean substrate.

3.3 INSTALLATION

A. General Requirements:

1. Install cement underlayment using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

2. Remove and replace cement underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.
3. Installed cement underlayment must be warrantable. Do not install, correct, or replace cement underlayment in a manner that is un-warrantable by the manufacturer; or that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Thickness: Install screeds as required, recommended, or accepted by the manufacturer.
 - a. Set screeds with a laser level so the minimum cement underlayment thickness is at least 1/8-inch.
 - b. Where cement underlayment covers only a small area, grind, chisel, and undercut floor and deck slabs as necessary to ensure a minimum cement underlayment thickness of at least 1/8-inch.
2. Place cement underlayment in one continuous operation, without cold joints, to produce uniform and level surfaces.
 - a. Screed cement underlayment to levels and tolerances required, recommended, or accepted by the finish flooring manufacturer.
 - b. Feather edges to match adjacent floor elevations.
3. Cure cement underlayment in conformance with the manufacturer's instructions. Protect cement underlayment to prevent contamination during installation and curing.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean spills, stains, and soiling from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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DIVISION 05

METALS

SECTION 05 05 23 – METAL FASTENINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-structural fastening materials.
2. Non-structural cast-in-place anchors.
3. Non-structural post-installed anchors.
4. Non-structural mechanical fasteners.
5. Delegated design of selected fasteners.
6. Site tests and inspections.
7. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 RELATED DOCUMENTS

- ##### A.
- This specification supplements the requirements of other specification sections. Additional fastening requirements specific to a work result are specified within the applicable specification sections.

1.3 REFERENCES

A. Abbreviations and Acronyms:

1. ACI: American Concrete Institute.
2. AWS: American Welding Society.
3. HDG: Hot-Dip Galvanized.
4. UTS: Unified Thread Standard.
5. UNC: Unified Coarse Thread Series.
6. UNF: Unified Fine Thread Series.

B. Definitions:

1. Manufacturer: Means the fastening manufacturer, unless otherwise indicated.
2. Bolt: Means a threaded fastener 1/4-inch or larger in diameter that is designed to be used either with nuts or in tapped holes.
3. Post-Installed Anchor: Means anchor elements designed for transferring tension and shear loads to structural concrete or masonry elements and installed in pre-drilled holes in the substrate.
4. Screw: Means a threaded fastener less than 1/4-inch in diameter.

- a. Machine Screw: Means a screw that that is designed to be used either with nuts or in tapped holes.
 - b. Thread Cutting/Thread Forming (Hi-Lo) Screw: Means a screw with a tapered shaft that is designed to be used in un-threaded substrates.
5. Stud: Means a threaded rod.
 6. Structural: Means the components of building systems, including roof/ceiling assemblies, parapets, lintels, floor/ceiling assemblies, girders, beams, columns, axial-load-bearing walls, and foundations, designed to transfer or distribute building loads, including snow, rain, wind, live, dead, seismic, earth, and flood loads to ground.
 7. Thread: Means the thread form and series in conformance with the following UTS designations.

Size Designation	Shank Diameter (inch)	Threads per Inch (UNC)	Threads per Inch (UNF)
#0	0.060	-	80
#1	0.730	64	72
#2	0.086	56	64
#3	0.099	48	56
#4	0.112	40	48
#5	0.125	40	44
#6	0.138	32	40
#8	0.164	32	36
#10	0.190	24	32
#12	0.216	24	28
1/4-inch	0.250	20	28
5/16-inch	0.3125	18	24
3/8-inch	0.375	16	24
7/16-inch	0.4375	14	20
1/2-inch	0.500	13	20
9/16-inch	0.5625	12	18
5/8-inch	0.625	11	18
3/4-inch	0.750	10	16
7/8-inch	0.875	9	14
One-inch	1.000	8	12

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Delegated Design:

1. Select and install fastenings that conform to the profiles indicated and other Contract Document requirements; meet specified performance criteria; and results in structurally sound, and non-corroding attachments that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
 2. Maintain visual design concept indicated, including profiles and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.
- B. Coordination: Provide fasteners and accessory materials suitable to the type of use and conditions of installation and service indicated; and as required for producing secure attachment to supporting construction without staining or deterioration of either the base materials or fastened materials; or deterioration of the fastener itself when in contact with base materials or fastened materials.
1. Verify fasteners are made of the same material as the fastened material or have a suitable barrier protection coating.
 - a. Apply corrosion-inhibiting material (e.g., pastes, washers, compounds, etc.) under the heads of screws or bolts inserted into dissimilar metal, even if they already have been treated or have a protective coating.
 - b. Washers, gaskets, and sleeves must be made of plastic or closed-cell polychloroprene (Neoprene).
 2. Provide fasteners and accessories that are galvanically compatible with fastened materials under conditions of installation and service, as demonstrated by the fastener manufacturer based on testing and field experience. Do not use fasteners that are corrosive or otherwise incompatible with fastened materials.
 3. Where fasteners are subject to loosening or turning out due to thermal and structural movements, wind loads, vibration, and other causes, provide self-locking devices that either maintain tension in the fastener assembly or remain locked even if tension in the assembly is lost. (e.g. washers, locknuts, and similar items)
 4. Unless otherwise indicated or unavoidable, provide concealed fasteners for interconnecting components and for attaching and fastening work to adjacent construction. Where unavoidable, provide flat head cap screws (type FHCS) with drive slots filled and finished flush and smooth with adjacent surfaces.

1.5 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submittal requirements for fastenings specific to a work result are specified within the applicable specification sections.
 2. Samples: When requested by the Architect, submit full-size samples of each selected metal fastener.

1.6 QUALITY ASSURANCE

- A. Quality Standard: Post-installed anchors in concrete must conform to the requirements of ACI publication ACI 355.2 *“Qualification of Post-Installed Mechanical Anchors in Concrete”*.

1.7 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 - 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 - 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 - 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
 - 1. Furnish adequate dunnage and bracing during storage.
 - 2. Prevent stored items from contacting the floor and from deterioration and damage.
 - 3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
- C. Handling: Handle items in conformance with manufacturer’s instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective fasteners with undamaged new fasteners that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 SOLDERING AND WELDING MATERIALS

- A. Soldering Materials:
 - 1. HDG Sheet Metal Solder and Flux: 50-percent tin solder conforming to ASTM B 32 Grade Sn50 and used with a non-corrosive flux.
 - 2. Stainless Steel Sheet Metal Solder and Flux: 60-percent tin solder conforming to ASTM B 32 Grade Sn60 and used with an acid flux.

B. Welding Materials:

1. Electrodes: Provide electrodes appropriate for the type and grade of metal being welded and the conditions of installation, use, and service. Welding rods and bare electrodes must conform to AWS specifications based on
 - a. physical properties of weld metal;
 - b. type of coating on electrode;
 - c. welding position of electrode; and
 - d. type of welding current used with electrode.
2. Filler Metal: Provide filler metal and electrode type and alloy recommended or accepted by the producer of the metal being welded, and as required for strength, corrosion resistance, and compatibility with fabricated items under the conditions of installation and service.

2.2 MECHANICAL FASTENER MATERIALS

A. Uncoated Carbon Steel Mechanical Fastener Material:

1. Screws: Manufactured from carbon steel wire rods and uncoated coarse round wire conforming to ASTM A 510, Grades 1018 to 1022.
2. Bolts: ASTM A 307, Grade A.
3. Nuts and Flat Washers: ASTM A 563, Grade C3.

B. Uncoated Stainless Steel Mechanical Fastener Material:

1. Description: Austenitic stainless-steel screws, bolts, and studs conforming to ASTM F 593 and nuts conforming to ASTM F 594 requirements for Alloy Group 1 (304 Series) or Alloy Group 2 (316 Series).
2. Performance Requirements:
 - a. Type 304: No sign of surface red rust after at least 1,000 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
 - b. Type 316: No sign of surface red rust after at least 1,500 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.

C. Uncoated Nonferrous Metal Mechanical Fastener Material:

1. Copper, brass, bronze, nickel, aluminum, and titanium nuts conforming to ASTM F 467 and commercial wrought bolts, hex cap screws, and studs conforming to ASTM F 468.
2. Provide alloy and temper suitable for the intended use and in-service loads, environmental exposure, and other conditions as required, recommended, or accepted by the manufacturer.

D. Uncoated Bi-Metal Mechanical Fastener Material:

1. Description: Fasteners having a fused stainless steel head and shank and hardened steel drill point.
2. Product: "Bi-Flex" fasteners manufactured by Elco Construction Products, or equal.

3. Performance Requirements: No sign of surface red rust after at least 800 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- E. Coated and Plated Mechanical Fastener Material:
1. Corrosion protective fastener coatings and platings must be deposited in conformance with the following.
 - a. Phosphate/Oil and Phosphate/Organic Coatings: ASTM F 1137.
 - b. Electrodeposited Coatings on Threaded Fasteners: ASTM F 1941.
 2. To verify the prevention of internal hydrogen embrittlement (IHE) in steel fasteners during surface preparation, pretreatment, and plating or coating, all plating or coating processes must be periodically audited in conformance with ASTM F 1940. New or revised plating or coating processes must also be qualified by ASTM F 1940.
 3. Plated fasteners with a hardness value of Rockwell 32 and higher must be baked promptly after plating at between 375 and 400 deg. F for at least 3 to 24 hours (depending on plating type and thickness) to neutralize hydrogen embrittlement. Baking must occur before chromating, and before application of subsequent coatings.
- F. HDG Steel Mechanical Fastener Material:
1. Description: HDG carbon steel fasteners having zinc coating conforming to
 - a. ASTM A 153 minimum coating weight requirements for Class C materials (fasteners over 3/8-inch diameter and similar articles; washers 3/16-inch and 1/4-inch thick) or Class D materials (fasteners 3/8-inch diameter and under, rivets, nails, and similar articles; washers under 3/16-inch thick); and
 - b. ASTM F 2329 for coating of threaded fasteners and washers.
 2. Performance Requirements: No sign of surface red rust after at least 32 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- G. Zinc-Plated Steel Mechanical Fastener Material:
1. Description: Carbon steel fasteners having electrodeposited zinc coating conforming to ASTM B 633, thickness Class Fe/Zn 5, Type I finish.(as-plated without supplementary treatment)
 2. Requisite Properties:
 - a. Sacrificial Coating: 5- to 8-micron (0.0002- to 0.0003-inch) electrolytically-deposited zinc plating.
 - b. Passivate: None.
 3. Performance Requirements: No sign of surface red rust after at least 32 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- H. Clear Chromate Finish Zinc-Plated Steel Mechanical Fastener Material:
1. Description: Carbon steel fasteners having electrodeposited zinc coating conforming to ASTM B 633, Thickness Class Fe/Zn 8, Type III supplementary finish. (clear chromate conversion coating)

2. Requisite Properties:
 - a. Sacrificial Coating: 8- to 12-micron (0.0003- to 0.0005-inch) electrolytically deposited zinc plating.
 - b. Passivate: Restriction of Hazardous Substances Directive (RoHS)-compliant clear trivalent chromate conversion coating. Hexavalent chromium conversion coatings are prohibited.
 3. Performance Requirements: No sign of surface red rust after at least 48 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- I. Pigmented Chromate Finish Zinc-Plated Steel Mechanical Fastener Material:
1. Description: Carbon steel fasteners having electrodeposited zinc coating conforming to ASTM B 633, Thickness Class Fe/Zn 25, Type II supplementary finish (color chromate conversion coating).
 2. Requisite Properties:
 - a. Sacrificial Coating: At least a 25-micron (0.00098-inch) electrolytically deposited zinc plating.
 - b. Passivate: Restriction of Hazardous Substances Directive (RoHS)-compliant trivalent chromate conversion coating having a green dye added to the clear tri-chrome bath or applied following the clear dip. Hexavalent chromium conversion coatings are prohibited.
 3. Performance Requirements: No sign of surface red rust after at least 48 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- J. Phosphate Coated Steel Mechanical Fastener Material:
1. Description: Carbon steel fasteners having corrosion-resistant zinc phosphate coating applied by the immersion bath method.
 2. Performance Requirements: No sign of surface red rust after at least 240 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- K. Polymer-Coated Steel Mechanical Fastener Material:
1. Description: Carbon steel fasteners having a fluoropolymer or Xylan coating that provides barrier protection against galvanic action.
 2. Barrier Coating: At least a 25-micron (0.00098-inch) electrolytically deposited zinc plating.
 3. Performance Requirements: No sign of surface red rust after at least 500 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- L. Baked Inorganic-Coated Steel Mechanical Fastener Material (e.g., Geomet, Dacromet, or equal):
1. Description: Carbon steel fasteners having a VOC-compliant, water-based, non-chrome (NC), nickel-, cadmium-, lead-, barium-, and mercury-free dispersion coating

- conforming to ASTM F 1136 containing metal oxides, metallic zinc, and aluminum flakes that becomes inorganic after curing.
2. Barrier Coating: At least an 8-micron (0.00098-inch) dip-spin and convection oven-cured coating.
 3. Performance Requirements: No sign of surface red rust after at least 500 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- M. Duplex Coated Anti-Corrosive Steel Mechanical Fastener Material:
1. Description: Carbon steel fasteners having a 2-coat finish that combines the sacrificial protection of steel base metal with the barrier protection of a polymer topcoat.
 2. Requisite Properties:
 - a. Basecoat: Inorganic zinc-rich coating.
 - b. Topcoat: Aluminum-rich, thermosetting epoxy resin (e.g., Magnigard, or equal); polyester resin (e.g., Climaseal, or equal); or fluoropolymer resin (e.g., Stalgard, FluoroKote#1, or equal).
 3. Performance Requirements: No sign of surface red rust after at least 800 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- N. 3-Coat Anti-Corrosive Steel Mechanical Fastener Material:
1. Description: Carbon steel fasteners having a 3-coat finish that combines the sacrificial protection of steel base metal with the barrier protection of a polymer topcoat.
 2. Requisite Properties:
 - a. Basecoat: Mechanically deposited zinc-alloy coating (coating is applied by mechanically tumbling zinc and tin powder with the base metal and non-metallic impact beads).
 - b. Intermediate Coat: Chromate conversion coating.
 - c. Topcoat: Aluminum-filled thermosetting polyester resin.
 3. Performance Requirements: No sign of surface red rust after at least 800 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- O. Ceramic-Coated Anti-Corrosive Steel Mechanical Fastener Material:
1. Description: Carbon steel fasteners having 3-coat finish that provides electrolytic corrosion protection by combining zinc sacrificial protection with ceramic topcoat barrier protection; and having a current evaluation report from the ICC-ES demonstrating code compliance.
 2. Application: Use ceramic-coated anti-corrosive steel fasteners
 - a. with pressure treated wood, including alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), copper azole (CBA-A and CA-B), copper citrate (CC), and disodium octaborate tetrahydrate (DOT);

- b. when attaching to exotic hardwood lumber base material;
 - c. with composite lumber; and
 - d. when attaching cement board, high-density exterior sheathing, and tile backer board to framing members at exterior walls, at high-moisture interior walls, and in high-corrosion environments.
3. Product: "Grabber" screws manufactured by Grabber Construction Products, or equal.
 4. Requisite Properties:
 - a. Basecoat An 8- to 10-micron (0.0003- to 0.0004-inch) mechanically deposited zinc-alloy coating.
 - b. Intermediate Coat: Chromate conversion coating.
 - c. Topcoat: Corrosion-resistant baked ceramic surface coating.
 5. Performance Requirements: No sign of surface red rust after at least 1,000 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.

2.3 CAST-IN-PLACE ANCHORS

- A. Description: Threaded steel anchor bolts (anchor rods) with hot-dip zinc coating conforming to ASTM F 1554 Grade 36 or weldable Grade 55, having Class 2A threads before zinc coating (non-headed anchor bolts, either bent or straight, having properties conforming to ASTM A 36, tensile strength of between 58 and 80 ksi, and intended for structural anchorage purposes) with hex-head nuts and flat washers conforming to ASTM A 563 chemical requirements for Grade A nuts.
- B. Requisite Properties:
 1. Size: Provide bolt or stud sizes required by engineering calculations for type of use indicated (between 1/4-inch and 4 inches).
 2. Coating: Hot-dip galvanize anchors, nuts, and washers in conformance with ASTM A 153 minimum zinc coating weight requirements for Class C materials.

2.4 POST-INSTALLED ANCHORS

- A. Description: ICC-ES-approved anchors conforming to the International Building Code.
- B. Manufacturer: Provide products manufactured by Hilti, Inc., or equal.
- C. Torque-Controlled Expansion Anchors:
 1. Description: Anchors actuated by tightening a bolt or nut. Expansion anchors installed in concrete must further conform to the requirements of ACI 355.2, Commercial Item Description A-A-1923A Type 4, and ACI-318 Appendix D.
 2. Product: "KB-TZ SS304" manufactured by Hilti, Inc. (ICC-ES Report ESR-1917), or equal.
 3. Performance Requirements: Expansion anchors must be rated to sustain without failure a load equal to at least 4 times the design load when installed in concrete; and

at least 6 times the design load when installed in unit masonry, when tested in conformance with ASTM E 488.

- D. Displacement-Controlled Expansion Anchors (Drop-In Anchors): Prohibited.
- E. Power-Actuated Fasteners:
 - 1. Description: Provide powder-actuated, pneumatic, or gas-powered direct fastening system for driving fasteners into concrete, CMU, and steel.
 - 2. Restrictions:
 - a. Power actuated-fasteners may not be used in concrete for sustained tension loads or for brace applications unless explicitly designed for seismic loading; except when used for support of acoustical tile or lay-in panel suspended ceiling applications and distributed systems where the service load on any individual fastener 90 pounds or less.
 - b. Power actuated fasteners may not be used in CMU unless explicitly designed for seismic loading.
 - c. Power actuated-fasteners may not be used in steel for sustained tension loads or for brace applications unless explicitly designed for seismic loading; except where the service load on any individual fastener is 250 pounds or less.

2.5 MECHANICAL FASTENERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Elco. (ICC-ES Report No. ESR-3332)
 - 2. Grabber Construction Products. (ICC-ES Report No. ESR-5280)
 - 3. Hilti, Inc. (ICC-ES Report No. ESR-2196)
 - 4. ITW Buildex. (ICC-ES Report No. ESR-3270)
 - 5. PrimeSource Building Products, Inc. (ICC-ES Report No. ESR-1408)
- B. Screw Fasteners:
 - 1. Application: Used for attaching to cold-formed or lightgage steel framing.
 - a. Fastening Together Cold-Formed or Lightgage Steel Members: ASTM C 1513.
 - b. Fastening Gypsum Panel Products, Metal Plaster Bases, Cementitious Backing Board and Cement Board to Cold-Formed Metal Framing: ASTM C 954.
 - c. Fastening Gypsum Panel Products and Metal Plaster Bases to Lightgage Metal Framing: ASTM C 1002, Type S.
 - d. Fastening Gypsum Panel Products and Metal Plaster Bases to Lightgage Metal Framing: ASTM C 1002, Type G.
 - 2. Requisite Properties:
 - a. Minimum Length: Screw fasteners must penetrate through metal framing with at least 3 exposed threads beyond the substrate.
 - b. Head Style:
 - 1) Provide wafer head screws when fastening together metal framing members and when fastening metal plaster bases to metal framing.

- 2) Provide bugle head screws when fastening gypsum panels to metal framing.
 - 3) Provide hex washer head screws with ethylene propylene diene monomer (EPDM) bonded sealing washers when fastening sheet metal panels, siding, roofing, flashings and similar items to metal framing. Provide exposed fastener heads with factory-applied coating matching prefinished roof or wall panel color.
 - 4) Fasteners not indicated to be overlaid either with gypsum panels or other substrates or finish materials may have hex washer, pan, pancake, modified truss, or pan framing head types.
- c. Drive Style: #2 Phillips drive, unless otherwise indicated.
- d. Point Style:
- 1) Attaching Cement Board: Hi-Lo type point.
 - 2) Attaching Sheet Metal and Lightgage Metal Framing (up to 30 mils and thinner): Self-piercing point.
 - 3) Attaching Sheet Metal and Cold-Formed Metal Framing (at least 33 mils and thicker): For normal, single-thickness material and multiple material thickness combined for total of between
 - a) 0.035- and 0.110-inch thick: Provide #2 self-drilling point.
 - b) 0.100- and 0.220-inch thick: Provide #3 self-drilling point.
 - c) 0.175- and 0.250-inch thick: Provide #4 self-drilling point.
 - d) 0.250- and 0.375-inch thick: Provide #5 self-drilling point.
- C. Bolts and Nuts:
1. Description: Regular bolts with hex-head nuts and flat washers.
 2. Requisite Properties:
 - a. Fastener Size: Unless otherwise indicated, provide at least 3/4-10 coarse thread bolts or studs in lengths required to provide a minimum thread engagement equal to the thread diameter, with at least one clear thread plus the thread lead (start) above the nut face, and at least one clear thread plus the thread run out beneath the nut face after tightening. Assume one washer will be used under the rotating part (generally the nut) and allow for this when selecting the bolt length.
 - b. Fastener Head Type: Hexagon-head with both the strength and type of steel used in bolt manufacture indicated on the head of the bolt by a raised mark conforming to ASTM bolt designation standards.

2.6 ACCESSORIES

- A. Expansion Shields: Die cast zinc alloy or zinc-coated steel single or double expansion shields manufactured for type of screw fastener indicated, specified, or selected. Lead or zinc and lead expansion shields are prohibited.
- B. Concrete Patching Mortar: Provide one of the following, or equal.
1. "EMACO S66 CI" manufactured by BASF.
 2. "SikaRepair 223" manufactured by Sika Corp.

- C. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify that in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install fastenings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Fasten work tightly to prevent rattle or vibration except where expansion-contraction tolerances are required.
 - 3. Installed fastenings must be warrantable. Do not install, correct, or replace fastenings in a manner that is un-warrantable by the manufacturer; or that results in any warranty or guarantee becoming void.
- B. Screw Fastener Special Techniques:
 - 1. Maintain bit engagement until fastener is completely driven and fastener stops rotating.
 - 2. Install screws flush with surface; do not countersink or over-drive screw fasteners.
- C. Post-Installed Anchor Special Techniques:
 - 1. Examination: Inspect substrates to verify conditions of access, interference, and existing materials.

- a. Using non-destructive methods, verify locations of reinforcement and post-tensioning tendons in drill locations.
 - b. Use care and caution to avoid cutting or damaging reinforcement.
 - c. Unless otherwise indicated, maintain a clearance of at least 1 inch between tendon sheaths and anchors or dowels.
2. Layout:
- a. Locations and Spacing: Indicated on the Drawings.
 - b. Edge Distance: At least 10 nominal bolt diameters when installed in concrete.
3. Drilling and Preparing Holes:
- a. Holes may not be drilled in concrete or into grouted CMU until at least 7 days after concrete is cast or grout is placed; and until concrete or grout achieves its specified design compressive strength.
 - b. Unless otherwise indicated, holes must be drilled using the manufacturer's recommended drill type, bit, and setting.
 - c. Hole diameters must conform to manufacturer's instructions; hole depth as indicated on the Drawings.
 - d. Abandon over-drilled holes and fill with specified patching mortar.
 - e. Abandon drilled holes and fill with specified patching mortar when hole deviates more than 5 degrees, measured from a line normal to the concrete surface.
 - f. Promptly notify Architect if concrete reinforcing bars or post-tensioning tendons are encountered during drilling.
 - g. Dust and other contaminants must be completely removed from holes by blowing with compressed air or other effective methods.
- D. Expansion Anchor Special Techniques:
1. Install anchors into pre-drilled and properly-prepared holes in conformance with the manufacturer's installation instructions.
 2. Expansion anchor embedment may not be less than required by the manufacturer.
 - a. Embedment length excludes thickness of finish coverings and other overlays.
 - b. When installed overhead into concrete slabs through metal decking, embedment must extend within a zone between 1-1/2 inches above top of flute and 3/4-inch below top of concrete.
 3. Tighten anchors to the manufacturer-recommended installation torque values.
- E. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach fastenings to supporting construction.
- F. Installation Tolerances: Install fastenings to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.3 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. General: Include site tests as part of the work of this specification section. The Owner's testing and inspection agency performs tests and inspections.
 - a. Schedule and arrange all tests and inspections.
 - b. Coordinate all work and the final construction schedule with all tests and inspections.
 - c. Coordinate tests and inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.
 - d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
 - e. Arrange tests and inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
 - f. Witness all site tests and inspections.
 - g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
 - h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.
2. Required Tests: Perform static tension load tests in conformance with ASTM E 488, "*Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements*" on at least 10 percent of each installed anchor diameter or as indicated on the Drawings.
 - a. Expansion Anchor Testing: Scheduled tests may not be performed less than 24 hours after anchor installation. Scheduled test loads are applied for 2 minutes during which the maximum allowable slip is not more than 1/8-inch.
 - b. Additional Testing: If an anchor fails tension load testing, additional anchors must be tension load tested until at least 20 consecutive successful tests are performed.
 - c. Testing Documentation: The testing and inspection agency develops and implements a clear method of identifying in-service locations and results of anchor tests. Field marking for test locations may not affect the appearance of exposed concrete or CMU. Detailed drawings recording test locations and results are permitted in lieu of field marking.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;

2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Corrective and repair work must be inspected by the testing and inspection agency.
1. Remove and replace anchors at failed test locations.
 2. When approved by the testing and inspection agency, install replacement anchors or dowels in existing holes. Existing holes not approved by the testing and inspection agency are considered defective work.
 3. All replacement anchors must be tension load tested.
- D. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

END OF SECTION

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SECTION 05 40 00 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Furring
2. Stud framing.
3. Specialty framing.
4. Connectors.
5. Wall backings.
6. Slot metal channel framing.
7. Delegated design of framing.
8. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 22 26 for metal suspension systems.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. AISI: American Iron and Steel Institute.
2. AWS: American Welding Society.
3. BMT: Base Metal Thickness.msg
4. MSG: Manufacturer's Standard Gage for Sheet Steel.
5. HDG: Hot Dip Galvanized.

B. Definitions:

1. Manufacturer: Means the metal framing manufacturer, unless otherwise indicated.
2. Metal Framing: Means cold-formed metal framing.
3. Gage: Means the thickness of sheet metal based on weight measured in pounds per square foot per inch of thickness. For the purposes of this specification, gages are classified the Table below. Minimum thickness indicated in the first column is equivalent to 95 percent of the design thickness and is the minimum acceptable thickness of base metal delivered to the project site.
4. Manufacturers' Standard Gage for Sheet Metal: Means the steel sheet thickness based on a weight of 41.82 pounds per square foot per inch of thickness.

5. Base Metal Minimum Thickness: Means the thickness of sheet steel material without any coatings.
6. Lightgage Metal Framing: Means metal framing members having a BMT of 30 mils BMT (MSG 20) or less and installed in non-load bearing interior construction assemblies typically supporting plaster or gypsum board.
7. Cold-Formed Metal Framing: Means metal framing members having a BMT range of between 118 mils BMT (MSG 10) and 33 mils BMT (MSG 20) and installed in transverse or axial load-bearing applications, or in non-load bearing interior construction assemblies typically supporting plaster or gypsum board.

Reference Gage	Minimum Thickness (mils)	Design Thickness (inch)
Lightgage Metal Framing		
25	18	0.0188
22	27	0.0283
20	30	0.0312
Cold-Formed Metal Framing specified in this specification Section		
20	33	0.0346
18	43	0.0451
16	54	0.0566
14	68	0.0713
12	97	0.1017
10	118	0.1242

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

1. Engineer, fabricate, assemble, and install framing that conforms to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound, non-corroding, and weathertight assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

1. Exterior Wall Design Pressure: Calculate in conformance with American Society of Civil Engineers/ Structural Engineering Institute publication ASCE/SEI 7, "*Minimum Design Loads and Associated Criteria for Buildings and other Structures*".

2. Interior Partition Uniformly Distributed Lateral Live Load: At least 10 pounds per square foot.
3. Superstructure Displacement:
 - a. Vertical Displacement of Adjacent Stories (Live Load Deflection): Allow for at least 3/4-inch vertical live load structure deflection, unless otherwise indicated on the structural drawings and general notes.
 - b. Horizontal Displacement of Adjacent Stories (Interstory Drift): Accommodate design displacement of adjacent stories indicated on the structural drawings and general notes.
4. Seismic Loads: Resist, distribute, or transfer seismic loads indicated on the structural drawings without incipient or catastrophic failure.
5. Perpendicular Deflection (Convexity and Concavity): Framing members may not deflect more than shown in International Building Code or the following, whichever is less, measured normal to the assembly plane. Limit asymmetric wall construction deflection to the most stringent requirement that applies to the assembly.
 - a. Construction Supporting Masonry: Not more than $L/600$.
 - b. Construction Supporting Stone: Not more than $L/720$.
 - c. Construction Supporting Wall Panels: Not more than $L/180$.
 - d. Construction Supporting Plaster: Not more than $L/360$.
 - e. Construction Supporting Gypsum Board: Not more than $L/240$.
 - f. Construction Supporting Tile: Not more than $L/360$.
6. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials. (changes)
7. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates as specified in Section 05 50 10.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing framing conditions not detailed on the product data or indicated on the Drawings; or that are detailed, but not in a manner specific to the project.
 - a. Show layouts, spacings, sizes, thickness, and types of metal framing, including reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, and accessories.
 - b. Show fasteners brackets, clips, and attachments to other work, including seismic bracing and slab edge conditions. Label each attachment type by manufacturer's

- product name. Show base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
- c. Show head of wall connections for fire-resistance rated assemblies, framed opening details, acoustical seals and tie-in conditions to fireproofing, and inside and outside corner conditions.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished framing.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
 - a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
 - b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
 - c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
 3. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
1. Framing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Quality Standards:

1. Design Standards:
 - a. Comply with all requirements of the International Building Code (IBC).
 - b. Comply with the requirements AISI publications S100, "*North American Specification for the Design of Cold-Formed Steel Structural Members*" and SG03 "*Cold-Formed Steel Design Manual*" for cold-formed steel framing design.
2. Material Standards:
 - a. Comply with the requirements of AISI publication, "*Standard for Cold-Formed Steel Framing - General Provisions*".
 - b. Comply with the requirements of AISI publication, "*Standard for Cold-Formed Steel Framing - Header Design*".
3. Welding Standards: Welding procedures must conform to the requirements of the following American Welding Society publications.
 - a. AWS D1.3, "*Structural Welding Code – Sheet Steel*".
 - b. AWS D9.1, "*Sheet Metal Welding*".
 - c. AWS D19.0, "*Welding Zinc Coated Steel*".

C. Qualifications:

1. Installer: Company or individuals must have at least 5 years' experience installing framing for at least 30 previous projects similar to this project in size, material, design, and complexity.
2. Welders: Welding personnel and supervisors must comply with, and welding procedures must conform to, the "*Qualification*" requirements of American Welding Society publications AWS D1.3, "*Structural Welding Code – Sheet Steel*" and AWS D19.0, "*Welding Zinc Coated Steel*" applicable to the project. Only certified welders current in their certification may perform or supervise any welding work.
3. Supervisors: Individuals must have at least 7 years' experience installing framing for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading framing installers.
4. Engineer: Must be a licensed professional structural engineer registered to practice in Hawaii having at least 10 years' experience performing the kind of engineering services indicated for at least 20 previous projects similar to this project in size, material, design, and complexity.

- D. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate framing into the mockup as part of the work of this specification section.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.

- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
 - 1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
 - 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 - 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 - 4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective framing with undamaged new framing that does not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. California Expanded Metal Products Co. (CEMCO)
 - 2. Clarkwestern Dietrich Building Systems LLC.
 - 3. Olmar Supply Inc.
 - 4. SCAFCO Corp.

2.2 MATERIALS

- A. HDG Metallic-Coated Steel Sheet for Cold-Formed Framing: ASTM A 1003, ST50 (Structural Grade 50), with at least a G60 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.

2.3 COLD-FORMED FURRING

- A. Hat Furring Channels:

1. Products: "FC Series Furring Channel" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
2. Requisite Properties:
 - a. Depth: 7/8- or 1-1/2-inch deep channels, as indicated.
 - b. Minimum Thickness: At least 43 mils BMT (MSG 18).
 - c. Web: 1-1/4 inches wide.
 - d. Screw Flanges: 3/4-inch wide.

B. Z-shaped Furring Channels:

1. Products: "Z-Furring (ZF-Series)" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
2. Requisite Properties:
 - a. Depth: One to 3 inches deep, as indicated.
 - b. Minimum Thickness: At least 43 mils BMT (MSG 18).
 - c. Screw Flanges: 1-1/4 inches wide.

2.4 COLD-FORMED STUD FRAMING

A. Studs:

1. Description: Pre-punched roll-formed C-shaped framing members with manufacturer's standard knockout sizing and spacing.
2. Product: "Structural Stud S162 (CSJ)" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal. (ICC ES Report No. ESR-1166P and Los Angeles Research Report No. RR 25889)
3. Requisite Properties:
 - a. Depth: Indicated on the Drawings.
 - b. Minimum Thickness: At least 54 mils BMT (MSG 16).
 - c. Flanges: At least 1-5/8-inch (1-3/8- to 3) wide stiffened flanges with at least 1/2-inch returns (lip).

B. Tracks (Top and Bottom Runners):

1. Description: Un-punched roll-formed U-shaped runners manufactured from the same material to corresponding stud sizes and gages.
2. Product: "Structural Track" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal. (ICC ES Report No. ESR-1166P and Los Angeles Research Report No. RR 25889)
3. Requisite Properties:
 - a. Depth: Indicated on the Drawings.
 - b. Minimum Thickness: At least 54 mils BMT. (MSG 16)
 - c. Flanges: At least 1-1/2-inch wide unstiffened flanges.

C. Deflection Track Systems:

1. Description: Slotted roll- or brake-formed track installed in head-of-wall deflection conditions to accommodate vertical movement caused by normal head-of-wall and floor extension or compression.
 2. Product: one of the following, or equal.
 - a. "MaxTrack" slotted deflection track or "BlazeFrame" fire stop deflection track manufactured by Clarkwestern Dietrich Building Systems LLC. (Intertek Code Compliance Research Reports No. CCRR-0205)
 - b. "CEMCO Slotted Track (CST)" manufactured by CEMCO.
- D. Manufactured Bridging Channels:
1. Description: Roll-formed channel- or L-shaped stiffeners with pre-notched slots installed in both load-bearing and non-load bearing walls to help resist stud twisting.
 2. Products: "Spazzer 5400" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
 3. Requisite Properties:
 - a. Size: 1-1/2-inch wide by 1/2-inch deep.
 - b. Minimum Thickness: At least 54 mils BMT (MSG 16).
 4. Bridging Clips: "Spazzer Bar Guard" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
 5. Alternative Bridging Clips: As an alternate to manufactured bridging clips, 1-1/2-inch wide by 1/2-inch deep by full stud width cold-rolled angle clips manufactured from at least 54-mil (MSG 16) BMT HDG metallic-coated steel sheet may be provided.
- E. Cold Rolled Channel (CRC) Bridging:
1. Description: Un-punched roll-formed U-shape stiffeners installed in both load-bearing and non-load bearing walls to help resist stud twisting.
 2. Requisite Properties:
 - a. Size: 1-1/2-inch wide by 1/2-inch deep.
 - b. Minimum Thickness: At least 54 mils BMT (MSG 16).
 - c. Flanges: 1-1/2 inches wide unstiffened flanges.
 3. Manufactured Bridging Clips: "EasyClip U-, B-, or X-Series Clip Angles" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
- F. Flat Strap Bridging (Strapping):
1. Application: Flat sheet installed to provide resistance to stud rotation and minor axis buckling under loads for studs deeper than 6 inches.
 2. Requisite Properties:
 - a. Width: Between 2 and 20 inches, as indicated or necessary.
 - b. Minimum Thickness: At least 54 mils BMT (MSG 16).
- G. Built-Up Headers:
1. Built-Up Curtain Wall Headers: Un-punched roll-formed C-shaped framing members and U-channel runners.

2. Load-Bearing Box Beam Headers: Un-punched roll-formed C-shaped framing members.
3. Requisite Properties:
 - a. Depth: Indicated on the Drawings.
 - b. Minimum Thickness: At least 54 mils BMT (MSG 16).
 - c. Flanges: 1-5/8-inch wide stiffened flanges with at least 1/2-inch returns (lip).
4. Header Connectors:
 - a. Description: Connectors to attach either beams to columns or headers to jambs.
 - b. Product: "DROP'N LOCK CLIP" connectors manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.

2.5 SPECIALTY FRAMING

- A. KCS Studs (King Kong Studs):
 1. Description: Pre-punched C-shaped framing members with manufacturer's standard knockout sizing and spacing.
 2. Requisite Properties:
 - a. Depth: Indicated on the Drawings.
 - b. Minimum Thickness: At least 54 mils BMT (MSG 16).
 - c. Flanges: 3-inch wide stiffened flanges with at least 7/8-inch returns (lip).
- B. Manufactured Headers:
 1. Description: One- or 2-piece pre-engineered header with associated inserts and clips.
 2. Products: one of the following, or equal.
 - a. "RedHeader RO Rough Opening System" manufactured by Clarkwestern Dietrich Building Systems LLC.
 - b. "Pro-X" manufactured by Brady Construction Innovations, Inc.
- C. Corner Angles:
 1. Description: Utility angles installed as a connection strut or angle, as corner reinforcement, or other various framing applications.
 2. Requisite Properties:
 - a. Minimum Thickness: At least 30 mils BMT (MSG 20).
 - b. Legs: 2- or 3-inch wide legs, as indicated, unless a wider or uneven leg size is explicitly indicated; or is otherwise supplied, required, recommended, authorized, or accepted by the manufacturer.

2.6 CONNECTORS

- A. Bypass Connectors:
 1. Description: Clips used to attach exterior curtain wall studs to building superstructure and to provide vertical building movement independent of metal stud framing.

2. Bypass Slab Connectors: "Slide Clip" (minimal or no standoff conditions) or "Fast Clip Slide Clip" (medium standoff conditions) manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
 3. Bypass Structure Connectors: "Quick Clip" (medium standoff conditions) and "Extended Fast Clip Slide Clip" or "Fast Strut" (large standoff conditions) manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
- B. Multipurpose Connectors Rigid Connectors: "Uni-Clip" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.

2.7 WALL BACKINGS

A. Metal Wall Backings:

1. Description: General multipurpose flat sheet and formed metal stock used as backing to support shelves, cabinets, fixtures or handrails when applied to framing. Provide wall backing in addition to, not as a replacement for, tension strapping or cross bracing.
2. Heavy-Duty Backing: Installed to support items distributing not more than 80 pounds per stud.
 - a. Material: 6-inch wide un-punched U-shaped runners manufactured from minimum 54-mil BMT (MSG 16) HDG metallic-coated steel sheet.
 - b. Provide individual runner in lengths long enough to span across at least 3 studs.
 - c. Notch and bend track legs so that backing plate is flush with exterior face of stud.
 - d. Do not cut track legs between supporting studs.
 - e. Fasten backing track to each stud with at least 3 screw fasteners per stud.
3. Medium-Duty Backing: Installed to support items distributing not more than 20 pounds per stud.
 - a. Material: Minimum 6-inch wide un-punched U-shaped runners manufactured from minimum 54-mil BMT (MSG 16) HDG metallic-coated steel sheet.
 - b. Provide individual runner in lengths long enough to span across at least 2 studs.
 - c. Fasten backing track to each stud with at least 3 screw fasteners per stud.
4. Light-Duty Backing: Installed to support items distributing not more than 5 pounds per stud.
 - a. Backing Material: Minimum 6-inch wide backing strip manufactured from minimum 54-mil BMT (MSG 16) HDG metallic-coated steel sheet.
 - b. Provide individual runner in lengths long enough to span across at least 3 studs.
 - c. Fasten backing track to each stud with at least one screw fasteners per stud.

B. Wood Wall Backings:

1. Description: Fire-retardant treated wood (FRT) backing system.
2. Product: "Danback Flexible Wood Backing System" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
3. Requisite Properties:
 - a. Material: Nominal 3/4-inch thick CDX Douglas fir fire-retardant treated wood

- b. Dimensions: 48 inches long by 5-1/8 inches high.

2.8 SLOT METAL CHANNEL FRAMING

- A. Description: Continuous slot metal channel framing conforming to MFMA-4, and associated fittings and hardware necessary for supporting cable trays, conduit, pipes and similar items.
- B. Material: At least 0.0747-inch BMT (MSG 14) HDG metallic-coated steel sheet complying with ASTM A 653, structural steel (SS), Grade 33 or better, at least a G90 zinc coating designation on both surfaces with equal coating weight on each surface.
- C. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Flex-Strut, Inc.
 - 2. PHD Manufacturing, Inc.
 - 3. Unistrut Corp.
- D. Product: "P300 SL" manufactured by Unistrut Corp., or equal.
- E. Requisite Properties:
 - 1. Types: standard and welded combination channels as required by conditions of installation and service.
 - 2. Height: heights as required by engineering calculations to meet load capacities, but not less than 1-3/8 inches.
 - 3. Suspension System: Hot-dip galvanized coarse-threaded (UNC) carbon steel rods having diameters as required by engineering calculations to meet load capacities, but not less than 3/8-inch.
- F. Accessories: kickers, perimeter angle pieces and other accessories as supplied, required, recommended, or accepted by the slotted channel framing manufacturer and necessary for a complete and structurally-sound installation.
- G. Finish: Chemically treated where retaining natural zinc finish; bonderized where painted finish is indicated.

2.9 ACCESSORIES

- A. Sill Sealer and Liner Gaskets:
 - 1. Description: Self-adhering closed cell polyethylene foam air and moisture barrier.
 - 2. Applications:
 - a. Sill Sealer: Install on the top of foundation wall, slab-on-grade. or curbs beneath exterior wall runner track or sill plates.
 - b. Plate Liner: Install between floor deck and interior wall runner track or sill plates at shafts, hoistways, and other locations where necessary or indicated.
 - 3. Products: the following products manufactured by Protecto Wrap Co.

- a. Sill Sealer: 3/8-inch thick "Protecto Triple Guard Energy Sill Sealer", or equal.
 - b. Plate Liner: 1/4-inch thick "Protecto Energy Plate Liner", or equal.
- B. Shims: Load bearing, non-leaching, high-density multimonomer plastic.
- C. Screw Fasteners: #8- and #10-32 UNC 2B (0.164- and 0.190-inch shank diameter, 32 threads per inch) by at least one-inch long, pan head, coarse thread, self-drilling uncoated bi-metal screw fasteners, unless another fastener type is explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- D. Power-Actuated Fasteners:
1. Description: ICC-ES-approved anchors conforming to International Building Code Occupancy Category III, Seismic Design Category E, unless a more stringent Occupancy Category or Seismic Design Category is indicated on the Structural Drawings.
 2. Manufacturer: Provide products manufactured by Hilti, Inc., or equal.
- E. Fastenings: backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- F. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install framing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Installed framing must be warrantable. Do not install, correct, or replace framing in a manner that results in any warranty or guarantee becoming void.

B. Metal Furring Special Techniques:

1. Direct Furring: Attach to concrete or to masonry with stub nails, screws designed for masonry attachment, or power-actuated fasteners spaced 24 inches on center.
2. Z-Furring:
 - a. Except at outside corners, securely attach narrow flanges of furring members to walls with concrete stub nails, screws designed for masonry attachment, or power-actuated fasteners spaced 24 inches on center.
 - b. At outside corners, attach wide flange of furring members to walls with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

C. Metal Framing Special Techniques:

1. Align and securely attach floor and ceiling tracks to superstructure.
2. Install studs in single lengths extending from floor to underside of floor or roof structure above without joints, except where indicated on the Drawings as stopping at or above ceilings. Stud splicing is prohibited without prior written authorization from the Architect.
 - a. Install studs so that flanges within framing systems point in same direction.
 - b. Continue framing around ducts that penetrate partitions above ceilings.
 - c. Where framing extends to overhead structural supports, install vertical deflection connectors to produce joints at tops of framing assemblies that prevent axial loading of finished assemblies.
 - d. Where studs stop at or above ceilings, brace not more than every fourth stud with opposite-side bracing installed at 45-degree angles and securely fastened to the underside of the floor or roof structure above.
 - e. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
 - f. Assemble corners using at least 3 studs.
3. Unless otherwise indicated, provide screw attachment to tracks for
 - a. studs with gypsum board on only one side;
 - b. studs on each side of doors and windows;
 - c. studs supporting wall hung plumbing fixtures; and
 - d. studs supporting wall hung urinal screens, toilet compartments, cabinets, equipment, and similar items.

4. Attach all other studs to tracks either by friction fit for single stud gypsum board partitions or by attaching with screws in conformance with the manufacturer's published installation instructions.
 - a. Space anchors within 6 inches of ends of each track segment ends, and not more than 24 inches on center.
 - b. Do not install fasteners within 3 inches of slab or curb edges.
 5. Where required by engineering calculations, install horizontal bridging spaced not more than 54 inches on center. Unless otherwise indicated, provide bridging in partitions supporting wall supported cabinets.
 - a. Tack-weld stiffeners to each stud.
 - b. Provide an additional 3/4 inch channel 6 inches above door headers, and extend at least 3 studs beyond the jamb studs.
 - c. Install channels in longest possible lengths. At end joints, lap at least 12 inches and wire-tie. Do not tie together channels on opposite sides of staggered or double stud partitions.
- D. Door and Window Opening Special Techniques:
1. Provide double studs (installed face to face to form a tube) at locations adjacent to doors and openings.
 2. Extend studs at door openings to slab or deck above and securely anchor both to bottom track and to top slab or deck.
 3. Locate additional studs not more than 2 inches from door and window frames, abutting partitions, partition corners, and other construction.
 4. Install sections of track over door and window frames with clip angles securely attached at each end to adjacent vertical studs. Install cut-to-length studs at vertical joint locations; and at standard spacing over the door frame header extending to the ceiling track.
 5. Install cripple studs at opening heads adjacent to each jamb stud, with at least a 1/2 inch clearance from the jamb stud to allow for installation of control joint in the finished assembly.
- E. Other Opening Special Techniques: Unless otherwise indicated, frame other openings and recesses in stud walls the same as that required for door openings.
1. Install framing below sills matching framing required above door heads.
 2. Provide additional framing as required for the secure attachment of electrical boxes, fire extinguisher cabinets, and similar items located in stud walls.
- F. Backing Plate Special Techniques:
1. Install supplementary framing and backing plates to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Wall-mounted and wall-hung items that require backing plates include the following.
 - a. Ladders.
 - b. Cabinets.
 - c. Door stops.

- d. Toilet compartments and screens.
 - e. Toilet accessories.
 - f. Grab bars.
 - g. Plumbing fixtures.
 - h. Other items when indicated.
2. Backing plates may be omitted if anchorage for wall-hung items is directly attached to at least 43-mil BMT (MSG 18) or heavier HDG metallic-coated cold-formed metal studs; or if the items are furnished with equivalent mounting devices.

- G. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach framing to supporting construction.
- H. Installation Tolerances: Install framing within the following tolerance variations.
1. Maximum Out of Plumb: Not more than $L/960$ of span, or 1/8-inch in 10 feet.
 2. Maximum Out of Level: Not more than $L/960$ of span, or 1/8-inch in 10 feet,
 3. Maximum Out of Plane: Fastening surfaces of adjacent framing members may not vary by more than 1/8-inch.
 4. Maximum Stud Spacing Variance: Not more than 1/8-inch. Cumulative error may not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

OUTPATIENT ONCOLOGY CLINIC
KONA COMMUNITY HOSPITAL
BIDDING DOCUMENTS

KYA INC.
PROJECT NO. 23043.00
04/05/2024

END OF SECTION

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SECTION 05 50 10 – INTERIOR METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shop-fabricated non-decorative metal items.
2. Shop-applied primer.
3. Delegated design of metal fabrications.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. AWS: American Welding Society.
2. DFT: Dry Film Thickness.
3. SSPC: The Society for Protective Coatings.

B. Definitions:

1. Manufacturer: Means the grout or bituminous paint manufacturer, as the context admits, unless otherwise indicated.
2. Fabricator: Means the metal fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

1. Engineer, fabricate, assemble, and install metal fabrications that conform to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound and non-corroding assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

1. Design Loads: Indicated on the Drawings.
2. Deflection: Not more than 1/8-inch.

3. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
4. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates as specified below.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 1. Product Data: For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings:
 - a. Submit dimensioned plans and elevations drawn to scale and showing metal fabrication layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
 - b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans and elevations.
 - c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
 - d. Show backings, embedments, fasteners, brackets, clips, cleats, straps, mounting devices, and other attachments.
 - e. Label each attachment type; indicate manufacturer's product name for each manufactured item.
 - f. Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
 - g. Label welds in conformance with the requirements of AWS publication A2.4, "*Standard Symbols for Welding, Brazing, and Nondestructive Examination*".
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
 - a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
 - b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners,

anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.

- c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Quality Standard:

1. Design Standard for Galvanized Items: Items indicated as galvanized must be designed and fabricated in conformance with the requirements of AGA publication, *"The Design of Products to be Hot-Dip Galvanized after Fabrication"*, and ASTM A 385. Limit the use of vent and drain holes and locate where they drain by gravity and are concealed from view in the finish work.
2. Welding Standards: Welding procedures must conform to the requirements of the following American Welding Society publications.
 - a. AWS D1.1, *"Structural Welding Code – Steel"*.
 - b. AWS D1.2, *"Structural Welding Code – Aluminum"*.
 - c. AWS D1.3, *"Structural Welding Code – Sheet Steel"*.
 - d. AWS D1.6, *"Structural Welding Code – Stainless Steel"*.
 - e. AWS D1.8, *"Seismic Supplement"*.
 - f. AWS D9.1, *"Sheet Metal Welding"*.
 - g. AWS D10.10, *"Heating Practices For Pipe And Tube"*.
 - h. AWS D10.11, *"Root Pass Welding For Pipe"*.
 - i. AWS D10.12, *"Pipe Welding – Mild Steel"*.
 - j. AWS D10.18, *"Pipe Welding – Stainless Steel"*.
 - k. AWS D11.2, *"Welding – Cast Iron"*.
 - l. AWS D18.2, *"Stainless Steel Tube Discoloration Guide"*.
 - m. AWS D19.0, *"Welding Zinc Coated Steel"*.

B. Qualifications:

1. Fabricator: Company or individuals must have at least 10 years' experience fabricating metal fabrications installed on at least 100 previous projects similar to this project in size, material, design, and complexity
2. Installer: Company or individuals must have at least 5 years' experience installing metal fabrications for at least 30 previous projects similar to this project in size, material, design, and complexity.
3. Welders: Welding personnel and supervisors must comply with the *"Qualification"* requirements of AWS quality standard publications. Only certified welders current in their certification may perform or supervise any welding work.
4. Supervisors: Individuals must have at least 7 years' experience installing metal fabrications for at least 30 previous projects similar to this project in size, material,

design, and complexity, including at least 2 years' supervisory experience directing and leading metal fabrication installers.

5. Engineer: Must be a licensed professional structural engineer registered to practice in Hawaii having at least 10 years' experience performing the kind of engineering services indicated for at least 20 previous projects similar to this project in size, material, design, and complexity.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.
 1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective metal fabrications with undamaged new metal fabrications that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 IRON

- A. Ductile Iron Castings: ASTM A 536, Grade 70-50-05 or better.

2.2 STEEL

- A. Steel Plate: ASTM A 36 (mild steel).
- B. Uncoated Steel Coil, Sheet, and Strip: Finished cold-rolled steel coil, sheet, and strip conforming to ASTM A 1008, CS Type B (commercial steel), unexposed (interior items) and exposed, temper rolled (exterior items), regular matte finish (40 to 59 AA), mill phosphatized.
- C. HDG Metallic Coated Steel Coil, Sheet, and Strip: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface, coating designation indicated below on both surfaces, minimized spangle, chemically treated, oiled, and mill phosphatized.
 - 1. Natural Finish: At least a G90 minimum coating designation (galvanized), minimized spangle, chemically treated, and oiled.
 - 2. Painted Finish: At least an A60 minimum coating designation (galvannealed), not chemically treated, not oiled, and mill phosphatized.
- D. Hot-Rolled Steel Rods, Bars, and Shapes: ASTM A 36 (mild steel), merchant quality.
- E. Steel Pipe: ASTM A 53, black pipe, Type and Grade as indicated below, size and weight class, schedule number, or outside diameter indicated and wall thickness as required by engineering calculations for type of use indicated.
 - 1. Type: Provide Type S (Seamless) pipe.
 - 2. Grade: Provide Grade A pipe for cold bending; otherwise provide Grade B pipe.
- F. Steel Tubing:
 - 1. Steel Structural Tubing: ASTM A 500, Grade A, black, round or shaped hot-formed tubing as indicated, outside diameter or dimensions as indicated, and calculated wall thickness as required by engineering calculations for type of use indicated. Provide seamless tubing.
 - 2. Mechanical Tubing: ASTM A 513, black, Type 5 M.D. (mandrel drawn or Drawn over a Mandrel).
- G. Steel Castings: ASTM A 27, Grade 65-35, Class 2 (post-weld heat-treatment not required).
- H. Galvanized Carbon Steel Wire: Soft temper zinc-coated wire conforming to ASTM A 641, minimum Class 4 coating weight.

2.3 STAINLESS STEEL

- A. Stainless Steel Bars, Hot-Rolled or Extruded Shapes: ASTM A 276, Condition T (hardened and tempered at a relatively high temperature), Type 304L (for welded applications) or Type 304 (for all other applications), passivated in conformance with ASTM A 967.
- B. Stainless Steel Pipe: ASTM A 312, Grade TP (pipe), Type 304L (for welded applications) or Type 304 (for all other applications), passivated in conformance with ASTM A 967.

- C. Stainless Steel Coil, Sheet, Strip, Plate, and Flat Bar:
 - 1. Exposed Locations: ASTM A 666 (annealed and tempered), Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 4 (soft) temper (hardness not more than Rockwell B-65; can be bent flat upon itself in any direction), passivated in conformance with ASTM A 967.
 - a. Uncoated (Bare) or Natural Finish: No. 2B (bright) finish.
 - b. Painted Finish: No. 2D (matte) finish.
 - 2. Concealed Locations: ASTM A 240 (annealed) Type 304L (for welded applications) or Type 304 (for all other applications), No. 2D (matte) finish, annealed, No. 4 (soft) temper (hardness not more than Rockwell B-65; can be bent flat upon itself in any direction), passivated in conformance with ASTM A 967.
- D. Stainless Steel Tubing: ASTM A 554, Grade MT (tubing), Type 304L (for welded applications) or Type 304 (for all other applications), No. 2D (matte) finish, passivated in conformance with ASTM A 967.
- E. Stainless Steel Castings: ASTM A 743, Grade CF8M or CF3M.

2.4 ALUMINUM

- A. General: Unless otherwise indicated, provide aluminum alloy and temper recommended by both the metal producer for the type of use, strength, and welding characteristics; and by the aluminum finisher for color match and compatibility of fabricated items with specified finish.
- B. Cold-Rolled Aluminum Bar and Rod: ASTM B 211.
- C. Extruded Bars, Shapes and Tubes:
 - 1. Standard Structural Profiles: ASTM B 308, Alloy 6061-T6.
 - 2. Extruded Aluminum Bars and Shapes: ASTM B 221.
 - a. Alloy and Temper: 6063-T5 or T6 for primary components; 6063-T5 or T6, 6005-T5, 6105-T5 or 6061-T6 for structural components.
 - b. Minimum Thickness: At least 0.125-inch.
- D. Sheet and Plate: ASTM B 209.
 - 1. Alloy and Temper: 5005-H32 (for anodic finishing), or alloy 3003-H14 (for painted or unfinished sheet).
 - 2. Minimum Thickness: At least 0.060-inch.
- E. Aluminum Pipe:
 - 1. Structural Aluminum Pipe and Round Tube: ASTM B 429.
 - 2. Seamless Aluminum Pipe and Seamless Extruded Tubes: ASTM B 241.
- F. Aluminum Tubing:
 - 1. Seamless Drawn Aluminum Tubes: ASTM B 210.

2. Extruded Aluminum Tubes: ASTM B 221 or ASTM B 483.

G. Aluminum Die and Hand Forgings: ASTM B 247.

H. Aluminum Castings: ASTM B 26.

2.5 ACCESSORIES

A. Flanges and Anchors: Unless otherwise indicated, provide cast or formed metal of the same type, material, and finish as the supported metal fabrications.

B. Grout:

1. Description: Pre-packaged, non-shrink, non-metallic, non-corrosive, non-staining, non-gaseous grout conforming to ASTM C 1107, Grade A (drypack) and Grades B and C (flowable grout) of a consistency suitable for application within a 30-minute working time.
2. Type: Grout specifically recommended by the manufacturer for interior and exterior applications.
3. Minimum 28-day Compressive Strength: At least 7,500 pounds per square inch.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.6 SHOP APPLIED STEEL PRIMER

A. Surface Preparation: Prepare surfaces in conformance with manufacturer-prepared published and supplemental instructions, and SSPC surface preparation standard SSPC-SP3, "*Power Tool Cleaning*".

B. Acrylic Primer:

1. Description: Hydrophobic acrylic dry-fall high performance coating primer
2. Application: Applied to interior exposed-in-service steel surfaces.
3. Product: "Uni-Bond DF Series 115" manufactured by the Tnemec Co., or equal.
4. Requisite Properties:
 - a. Minimum Thickness: Between 2.0 and 3.5 mils DFT per coat, when measured in conformance with SSPC paint application standard SSPC-PA2, "*Measurement of Dry Coating Thickness with Magnetic Gages*".
 - b. Color: Match Tnemec color 10-1009, "Gray".
5. Performance Requirements:
 - a. Minimum Dry Film Adhesion: At least a 5B rating, when tested in conformance with ASTM D 3359.
 - b. Minimum Humidity Resistance: No blistering, cracking, rusting, or delaminating of film after at least 500 hours exposure, when tested in conformance with ASTM D 4585.

- c. Minimum Salt Spray Resistance: No blistering, cracking, rusting, or delaminating of film and no rust creep at scribe after at least 500 hours exposure, when tested in conformance with ASTM B 117.
- d. Minimum Slip Coefficient Rating: At least 0.50 (AISC Class B surface), when tested in conformance with ASTM A 490.

2.7 FABRICATION

A. Shop Fabrication:

1. Fabricate items in largest sections practicable to minimize field jointing.
2. Fabricate exposed work precise, straight, and true to line, size, and shape; plumb, level, and square within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.
3. Fabricate exposed connections with flush hairline joints, and square and true edges and corners.
4. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the strength of the material.
5. Bend pipe without collapsing or deforming its walls, to produce a smooth, uniform curved section and to maintain uniform sectional shape.
6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
7. Cut, reinforce, drill, punch, thread, and tap metal fabrications as necessary to receive other fabrications, components, accessories, hardware, and similar items, and as required to securely attach to supporting construction
8. Before cleaning, treating, and applying specified finishes, remove blemishes by grinding.
9. Remove sharp or rough areas on exposed traffic surfaces. Ease exposed edges to a nominal 1/32-inch radius.

B. Fabrication Tolerances: Fabricated items must conform to the following; specified tolerances are non-cumulative.

1. Squareness: Not more than 1/8-inch difference in diagonal measurements.
2. Maximum Offset between Components at Joints: 1/16-inch except that at welded joints, offsets are prohibited.
3. Maximum Misalignment of Adjacent Members: 1/16-inch.
4. Maximum Bow: 1/8-inch in 48 inches.
5. Maximum Deviation from Plane: 1/16-inch in 48 inches.

C. Shop Priming: :

1. Install primer using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

2. Only install primers under conditions that ensure finishes are free from blemishes and defects.
3. To avoid surface contaminant pick-up, promptly prime prepared surfaces as soon as practicable after and within the same day as surface preparation.
4. Verify primer film thickness during application by taking numerous measurements.
5. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Primer surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
6. Do not exceed the application rates recommended by the manufacturer.
7. Installed primers must be warrantable. Do not install, correct, or replace primers in a manner that results in any warranty or guarantee becoming void.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify that in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed items.
- C. Evaluation and Assessment:
 1. Identify project conditions that do not conform to the fabricator's instructions and other requirements and recommendations.
 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for metal fabrication installation.
 2. Set metal fabrications true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
 3. Shim as required with concealed shims.
 4. Dry-pack metal fabrications supported on concrete and masonry to provide firm, level bearing surfaces.
 5. Provide temporary bracing or anchors for items indicated as built into concrete, masonry, or similar construction.

6. Fit exposed connections accurately to form flush hairline joints

B. Interface with Adjacent Items:

1. Attachment: Provide materials, components, and accessories normally furnished or necessary to securely attach metal fabrications to supporting construction.
2. Field Welding:
 - a. Comply with AWS quality standard publications for manual shielded arc welding procedures, appearance and quality of welds, and methods to correct faulty welds.
 - b. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - c. Before welding, grind to remove zinc coating from one to 4 inches from either side of the intended weld zone and on both sides of the item.
 - d. Obtain fusion without undercut or overlap.
 - e. Promptly remove welding flux.
 - f. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - g. Do not weld, cut, or abrade exterior surfaces hot-dip galvanized after fabrication and are for bolted or screwed field connections.
 - h. Field-weld connections indicated as exposed joints but cannot be shop-welded because of shipping size limitations.
 - i. Welds remaining exposed must be ground smooth and flush to match and blend with parent metal surfaces.
 - j. Clean field welds, weld spatter, bolted connections, and abraded areas promptly after installation.

C. Installation Tolerances: Install metal fabrications to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and

3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.
- D. Damaged Primer Touchup: Clean and prepare damaged primed surfaces in conformance with manufacturer's published instructions and SSPC surface preparation standard SSPC-SP11 "*Power Tool Cleaning to Bare Metal*".
 1. Sand smooth and re-clean.
 2. Spot-prime bare metal surfaces with specified primer applied to a total spot primer DFT of at least 5 mils.
 3. Overlap undamaged primer areas with spot primer at least 2 inches.
- E. Damaged Galvanizing Touchup: Repair damaged galvanized items or re-galvanize items that cannot be satisfactorily repaired to the Architect's acceptance.
 1. Zinc-Based Solder Repair: Repair damaged galvanizing in conformance with ASTM A 780 Annex A1.
 2. Organic Zinc-Rich Cold Galvanizing Compound Repair:
 - a. Repair damaged galvanizing in conformance with ASTM A 780 Annex A2
 - b. Apply cold galvanizing repair compound to a DFT of 1.5 plus or minus 0.5 mils per coat, when measured in conformance with SSPC publication SSPC-PA 2, "*Determining Compliance to Required DFT*". Provide 2 coats.

3.4 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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DIVISION 06

WOOD, PLASTICS, AND COMPOSITES

SECTION 06 10 54 – INTERIOR MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Utilitarian lumber and plywood not specified in other sections.
2. Telephone and electrical equipment backing panels.
3. Fire-retardant treated wood.
4. Rough hardware.
5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. ACQ: Alkaline Copper Quaternary.
2. APA: Means the Engineered Wood Association.
3. ASME: American Society of Mechanical Engineers.
4. AWPA: American Wood Protection Association.
5. CCA: Chromium Copper Arsenate.
6. FRTW: Fire Retardant Treated Wood.
7. S4S: Surfaced Four Sides.
8. WCLIB: West Coast Lumber Inspection Bureau.

B. Definitions:

1. Manufacturer: Means the plywood, PTW, FRTW, rough hardware, or accessory manufacturer, as the context admits, unless otherwise indicated.
2. Pressure-Treated Wood: Means either PTW or FRTW.

1.3 ADMINISTRATIVE REQUIREMENTS

- ##### A. Coordination: Provide fasteners and accessories suitable for the type of use and conditions of installation and service; and as required to produce secure attachment to supporting construction without staining or deterioration of either base materials or fastened materials; nor deterioration of the fastener itself when in contact with base materials and fastened materials.

1. Fastening Pressure-Treated Wood: Fasteners must resist corrosion when in contact with materials used in the pressure treating process that are either present at the time of installation or occur in the presence of moisture.
 - a. Provide ceramic-coated anti-corrosive steel fasteners and hot-dip galvanized steel connectors conforming to ASTM A 653 Class G185 or provide Type 316 stainless steel fasteners and connectors.
 - b. Fasteners and connectors made from uncoated (bare) carbon steel, electrodeposited zinc-coated steel, and aluminum are prohibited.
2. Elsewhere: Fasteners may be coated or uncoated, as selected by the Contractor, unless otherwise indicated or specified.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 1. Product Data: For manufactured items, submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing rough carpentry attachment to supporting construction; and other conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
 3. Samples: When requested by the Architect, submit full-size samples of selected metal fasteners.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished rough carpentry.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.

- B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.
 - 1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
 - 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 - 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 - 4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature.
 - 5. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to heat or sudden changes in temperature; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective materials with undamaged new materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide lumber and plywood manufactured by one of the following, or equal.
 - 1. Boise Cascade LLC.
 - 2. Georgia-Pacific Wood Products LLC.
 - 3. Louisiana-Pacific Corp.
 - 4. Weyerhaeuser NR Co.

2.2 SAWN LUMBER

- A. Timber for Wood Beams, Stair Stringers, and Posts: "SELECT STRUCTURAL" grade Douglas fir conforming to WCLIB Grading Rules, S4S, seasoned to a moisture content of not more than 19 percent, and stamped showing only the appropriate fiber stress in bending "F".

- B. Rough Sawn Lumber: “#1” or “#2” grade Douglas conforming to WCLIB Grading Rules, rough sawn, dried to a moisture content of not more than 19 percent, and stamped “S-DRY” or “KD”.
- C. Full-Dimension Lumber: “#1” or “#2” grade Douglas conforming to WCLIB Grading Rules, S4S, seasoned to a moisture content of not more than 19 percent, and stamped “S-DRY” or “KD”.

2.3 SOFTWOOD PLYWOOD

- A. Softwood Plywood:
 - 1. Minimum Sheathing Grade: “APA C-C Plugged & Touch Sanded EXT” grade plywood, unless otherwise indicated. Plywood panels must have a visible APA grade mark.
 - 2. Minimum Underlayment Grade: “APA Tongue & Groove” grade plywood, unless otherwise indicated. Plywood panels must have a visible APA grade mark.
 - 3. Minimum Size: At least 4- by 8-foot nominal sheet size.
 - 4. Minimum Thickness: At least 1/2-inch nominal thickness, unless otherwise indicated.
 - 5. Construction:
 - a. 3/4-inch plywood: 7-ply veneer core.
 - b. 1/2-inch plywood: 5-ply veneer core.
 - 6. Panel Edges: Square-edged.
- B. Telephone and Electrical Equipment Backing Panels:
 - 1. Minimum Grades: “APA Type A-D” grade sanded plywood. Plywood panels must have a visible APA grade mark.
 - 2. Minimum Thickness: At least 3/4-inch nominal thickness, unless otherwise indicated.
 - 3. Construction: 7-ply veneer core.
 - 4. Panel Edges: Square-edged.
 - 5. Finish: Field-applied intumescent white paint finish. Paint both sides of plywood to prevent warping.

2.4 FIRE-RETARDANT TREATED WOOD (FRTW)

- A. Description: Type A High Temperature (HT) wood products conforming to AWPA C20 and AWPA C27, manufactured with fire-retardant materials for which the fire-retardant manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested in conformance with ASTM D 5664 and ASTM D 5516.
- B. Application: Provide FRTW at the following locations and elsewhere where indicated.
 - 1. Framing for raised platforms.
 - 2. Concealed blocking.
 - 3. Plywood backing panels.

4. Other wood items installed within fire-resistive construction.
 5. Elsewhere where indicated.
- C. Restrictions: Fire-retardant products must not develop or advance metal fastener corrosion.
- D. Products: "Pyro-Guard" manufactured by Hoover Treated Wood Products, Inc., or equal

2.5 ROUGH HARDWARE

- A. Uncoated (Bare) Carbon Steel Fasteners:
1. Screws: Manufactured from carbon steel wire rods and uncoated coarse round wire conforming to ASTM A 510, Grades 1018 to 1022.
 2. Bolts: ASTM A 307, Grade A.
 3. Nuts and Flat Washers: ASTM A 563, Grade C3.
- B. HDG Zinc-Coated Steel Fasteners:
1. Description: Carbon steel fasteners with hot dip galvanized coating conforming to
 - a. ASTM A 153 minimum zinc coating weight requirements for Class C materials (fasteners over 3/8-inch diameter and similar articles; washers 3/16-inch and 1/4-inch thick) or Class D materials (fasteners 3/8-inch diameter and under, rivets, nails and similar articles; washers under 3/16-inch thick); and
 - b. ASTM F 2329 for coating of threaded fasteners and washers by hot-dip zinc galvanizing.
 2. Performance Requirements: No sign of surface red rust after at least 32 hours of ASTM B117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- C. Stainless Steel Fasteners:
1. Description: Austenitic stainless-steel screws, bolts, and studs conforming to ASTM F 593 and nuts conforming to ASTM F 594 requirements for Alloy Group 1 (304 Series) or Alloy Group 2 (316 Series).
 2. Performance Requirements:
 - a. Type 304: No sign of surface red rust after at least 1,000 hours of ASTM B117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
 - b. Type 316: No sign of surface red rust after at least 1,500 hours of ASTM B117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- D. Ceramic-Coated Anti-Corrosive Steel Fastener Material:
1. Description: Carbon steel fasteners having 3-coat finish that provides electrolytic corrosion protection by combining the sacrificial protection of zinc with the barrier protection of a ceramic topcoat and having a current evaluation report from the ICC-ES demonstrating code compliance.

2. Application: Use ceramic-coated anti-corrosive steel fasteners
 - a. with pressure treated wood, including alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), copper azole (CBA-A and CA-B), copper citrate (CC), and disodium octaborate tetrahydrate (DOT);
 - b. when attaching to exotic hardwood lumber base material;
 - c. with composite lumber; and
 - d. when attaching cement board and tile backer board to framing members at high-moisture and high-corrosion environments.
 3. Product: "Grabber" screws manufactured by Grabber Construction Products, or equal.
 4. Requisite Properties:
 - a. Basecoat An 8- to 10-micron (0.0003- to 0.0004-inch) mechanically deposited zinc-alloy coating.
 - b. Intermediate Coat: Chromate conversion coating.
 - c. Topcoat: Corrosion-resistant baked ceramic surface coating.
 5. Performance Requirements: No sign of surface red rust after at least 1,000 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
- E. Nails, Brads, and Staples: Provide fasteners conforming to ASTM F 1667.
1. Fastening Lumber to Lumber: Cement-coated or annular (ringed-shank) threaded nails of sufficient length to penetrate at least 1-1/4-inches into adjoining items; or stove or lag bolts used with washers.
 2. Fastening Plywood to Lumber: Annular (ringed-shank) threaded nails; at least size 8d for 1/2-inch panels and at least size 10d for 3/4-inch panels.
- F. Power-Driven Staples, Nails, P-nails, and Allied Fasteners: Must conform to ICC-ES Evaluation Report No. 1539.
- G. Wood Screws: Must conform to ASME B18.6.1.
- H. Steel Drill Screws for Fastening Wood to Cold-Formed Metal Framing: Must conform to ASTM C 954, except with wafer heads and reamer wings, length as recommended by the screw manufacturer for material being fastened.
- I. Bolts:
1. Steel Bolts: ASTM A 307 Grade A with hex nuts conforming to ASTM A 563, and flat washers where indicated.
 2. Anchor Bolts: ASTM F 1554 Grade 36. Provide hot-dip zinc-coated anchor bolts where item being fastened is galvanized.
 3. Lag Bolts: Must conform to ASME B18.2.1.

2.6 ACCESSORIES

A. Wood Glue:

1. Description: Yellow aliphatic resin polyvinyl acetate (PVA) glue.
2. Manufacturers: Provide products manufactured by one of the following, or equal.
 - a. Elmer's Products Inc.
 - b. Franklin International.
 - c. Gorilla Glue, Inc.
3. Products: Provide the following manufactured by Franklin International, or equal.
 - a. Interior Grade Glue: "Titebond Original" , or equal.
 - b. Moulding and Trim Glue: "Titebond Quick & Thick Mutisurface Glue", or equal.

B. Construction Adhesive:

1. Description: General purpose, indoor or outdoor, drillable, moisture resistant, sandable, heavy duty construction adhesive.
2. Product: "Titebond PROvantage" manufactured by Franklin International, or equal.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify that in-place construction satisfies all other conditions that might affect the quality of installation or the durability, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 1. Identify deficient and non-conforming project conditions.
 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for rough carpentry installation.

2. Set rough carpentry true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Fit exposed connections accurately to form flush hairline joints

B. Special Techniques:

1. Sort and select lumber so natural characteristics do not interfere with installation or with fastening. Do not use materials with defects that interfere with function or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
2. Provide blocking and framing normally furnished, indicated, or required to support facing materials, fixtures, specialty items, and trim.
3. Provide metal clips for fastening gypsum board or lath at corners and intersections where blocking or framing does not provide a surface for fastening edges of panels. Do not space clips more than 16 inches on center.
4. Install wood blocking, grounds, nailers, and other items where indicated or required for attaching other work.
5. Make tight connections between members.
6. Select fasteners of size that will not fully penetrate members where opposite side is exposed to view or will receive finish materials.
7. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Do not countersink nail heads, unless otherwise indicated.
8. Install fasteners without splitting wood.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach rough carpentry to supporting construction.

D. Installation Tolerances: Install rough carpentry within the following tolerance variations.

1. Maximum Out of Plumb: Not more than 1/4-inch in 10 feet.
2. Maximum Out of Plane: Not more than 1/8-inch.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and

3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 06 41 19 – PLASTIC LAMINATE-CLAD WOOD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shop-fabricated wood cabinets and casegoods.
2. Plastic laminate countertops.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 12 36 63 for solid surface material countertops.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. 2DL: 2D Laminate.
2. 3DL: 3D Laminate.
3. RTF: Rigid Thermoformable Foils.
4. HPL: High-Pressure Laminate.
5. HPDL: High-Pressure Decorative Laminate.
6. TFL: Thermally-Fused Laminate.
7. CPA: Composite Panel Association.
8. MDF: Medium Density Fiberboard.
9. NEMA: National Electrical Manufacturers Association.
10. WI: Woodwork Institute.

B. Definitions:

1. Manufacturer: Means plastic laminate, finish hardware, or accessory manufacturer, as the context admits, unless otherwise indicated.
2. Fabricator: Means the casework fabricator, unless otherwise indicated.
3. Self-Closing Hinge: Means a type of hinge that has a spring built into it so when a cabinet door starts to close, at some point the spring takes over and pulls the door closed with a tap.
4. Soft Closing Hinge: Means a type of hinge that has hydraulics built into it so when a cabinet door starts to close, at some point the hydraulics take over and ease the door closed silently; the cabinet door appears to glide closed.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate casework finish hardware with adjacent door hardware finishes.
2. Coordinate casework design with countertops. Provide reinforcement as required to support countertops and backing. Countertops must not deflect to the point of cracking when subjected to in-service loads.

B. Shelving Performance Requirements:

1. Design Load: Shelving must support at least 50 pounds per square foot uniformly distributed load; not more than 200 pounds total load per shelf.
2. Deflection: Limit deflection under maximum design load to $L/144$, except that all shelving in the same room, or space must have the same thickness where not concealed by doors. Minimum shelving thickness must be at least 3/4-inch.
3. Permanent Deformation: No permanent deformation at maximum design load after 48 hours continuous loading.

C. Sequencing:

1. Schedule casework deliveries to the project site only after the building is enclosed with a permanent enclosure; "wet work" within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install casework only after all other finishing operations are complete, especially overhead finishes.
3. After casework installation, maintain ambient conditions within design range until Final Completion.

D. Scheduling:

1. Acclimation: Allow sufficient time in the construction schedule to acclimate casework to specified ambient conditions for between 72 hours and 6 weeks before installation begins, or until moisture content is not more than 8 percent, when measured with a moisture meter at specified ambient conditions.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:

- a. Submit dimensioned plans and elevations drawn to scale and showing casework layout and types. Show locations, sizes, and extents of all casework, accessories, and trim. Label manufactured items by product name.
 - b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions specific to the project. Cross-reference details to plans and elevations.
 - c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
3. Samples: Submit at least one 8-inch square representative fabrication sample for each casework type, color, finish, and variety, including core panels, facings, and edgings.
- B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Operable parts for accessible casework must conform to the requirements of CBC Section 11B-309.
- B. Quality Standards:
1. Woodworking Standard: Provide casework conforming to Architectural Woodwork Institute/Architectural Woodwork Manufacturer's Association of Canada/Woodwork Institute publication "*Architectural Woodwork Standards*" requirements for each specified Grade.
- C. Qualifications:
1. Woodworkers and Finishers: Company or individuals must have at least 10 years' experience fabricating casework installed on at least 100 previous projects similar to this project in size, material, design, and complexity.
 2. Installer: Company or individuals must have at least 5 years' experience installing casework for at least 30 previous projects similar to this project in size, material, design, and complexity.
 3. Supervisors: Individuals must have at least 7 years' experience installing casework for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading casework installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.

- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
 - 1. Furnish adequate dunnage and bracing during storage.
 - 2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
 - 3. Do not leave items uncovered where they might become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
- C. Handling: Handle items in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective casework with undamaged casework that does not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOOD CASEWORK

- A. Cabinets and Caseworks: Faced panel casework conforming to the referenced woodworking quality standard, Section 10 requirements for Custom Grade, Construction Type A (frameless) single-length cabinet sections with Interface Style 1 (flush overlay) cabinet doors and drawers.

2.2 SOFTWOOD LUMBER

- A. Description: FSC-Certified dressed lumber, surface four sides (S4S) smooth without knife marks, unless otherwise indicated.
- B. Requisite Properties:
 - 1. Species: Douglas fir.
 - 2. Appearance Grade: Grade B & Better.

2.3 FACED PANEL CONSTRUCTION

- A. Plastic Laminate Facing and Edgebanding:
 - 1. Description: High-pressure decorative laminate (HPDL) conforming to NEMA LD-3.
 - a. Exposed Surfaces: General purpose type HPDL Grade HGS. Toe bases are exposed surfaces, unless indicated as receiving an applied base. (e.g., a resilient base)
 - b. Semi-Exposed Surfaces: Cabinet liner type HPDL, Grade CLS.
 - c. Concealed Surfaces: Backer type HPDL, Grade BKV.

2. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

B. Countertop Substrate Panels:

1. Description: Moisture-resistant composite fiber panels conforming to ANSI A208.2 and made from 100-percent post-industrial recycled wood fiber and having no added urea-formaldehyde resin.
2. Restrictions: Plywood, other than marine-grade plywood, is prohibited.
3. Products: "Medex" manufactured by Roseburg Forest Products Co., or equal.
4. Requisite Properties:
 - a. Minimum Density: At least 50 pounds per cubic foot.
 - b. Minimum Grade: At least Grade 150-MR 50.

C. Other Substrate Panels:

1. Description: Flame retardant composite fiber panels conforming to ANSI A208.2 and made from 100-percent post-industrial recycled wood fiber and having no added urea-formaldehyde resin.
2. Restrictions:
 - a. Plywood is prohibited for doors and drawers.
 - b. When accepted in writing by the Architect, plywood may be used for casework boxes. (accepted by WI, though not recommended)
3. Products: "Medite FR" manufactured by Roseburg Forest Products Co., or equal.
4. Requisite Properties:
 - a. Minimum Density: At least 50 pounds per cubic foot.
 - b. Nominal Thickness: At least 1/2-inch, unless otherwise indicated.
 - c. Minimum Grade: Grade 150.

2.4 FINISH HARDWARE

A. General:

1. Provide all hardware indicated, specified, and necessary for a complete installation.
2. Hardware finish must match the door hardware specified in Section 08 71 00, unless otherwise noted.

B. Manufacturers: Provide products manufactured by one of the following, or equal.

1. Accuride.
2. Blum, Inc.
3. Doug Mockett & Co., Inc.
4. Häfele America Co.
5. Sugastune Corp.

C. Pulls:

1. Description: Back-mounted pulls conforming to BHMA A156.9 Hardware Type No. A09021.
2. Products: "DP128 Series" pulls manufactured by Doug Mockett & Co., Inc., or equal.
3. Requisite Properties:
 - a. Size: 4-inches.
 - b. Finish: Satin nickel (17S).

D. Hinges:

1. Description: Frameless concealed hinges (European cup style) conforming to BHMA A156.9, B01601 with integrated soft-close mechanism in the hinge cup. Spring-type self-closing hinges are prohibited.
2. Product: "Salice Silentia Series" manufactured by Häfele America Co., or equal.
3. Requisite Properties:
 - a. Provide hinges with between 95 and 100 degrees of opening for cabinets having retractable doors; and for cabinets next to walls or similar obstructions.
 - b. Provide hinges with between 100 and 120 degrees of opening for cabinets requiring additional cabinet access.
 - c. Provide hinges with between 165 and 175 degrees of opening for cabinets requiring the most cabinet access; and for installations where there are drawer pullouts in the cabinets.
 - d. Provide at least 3 hinges for doors at least 24 inches wide or at least 36 inches high.
 - e. Provide either screw- or rapido-mounted hinges.

E. Full Extension Drawer Slides:

1. Description: Heavy Duty full extension slides conforming to BHMA A156.9 Hardware Type No. B05091, with decelerated closing
2. Products: Provide the following supplied by Häfele America Co., or equal.
 - a. Light Duty Side Mount Slides: "Accuride 2632" slides, or equal.
 - b. Medium Duty Side Mount Slides: "Accuride 3832EC" slides, or equal.
 - c. Heavy Duty Side Mount Slides: "Accuride 3657" slides, or equal.
 - d. Medium Duty Bottom Mount Slides: "Accuride 3132EC Eclipse Easy-Close" slides, or equal.
 - e. Heavy Duty S Bottom Mount Slides: "Accuride 9307" slides, or equal.
3. Grades:
 - a. Light Duty Slides: Provide BHMA-certified Grade 1, rated to at least 50 pounds per pair, for pencil drawers; and rated to at least 75 pounds per pair for general purpose drawers.
 - b. Medium Duty Slides: Provide BHMA-certified Grade 1HD-100, rated to at least 100-pounds per pair for file drawers up to 24 inches wide.
 - c. Heavy Duty Slides: BHMA-certified Grade 1HD-200, rated to at least 200 pounds per pair for lateral file drawers greater than 24 inches wide.
4. Mounting Style:
 - a. Provide side-mount slides for cabinet trays and drawers.

- b. Provide bottom-mount slides for cabinet pullouts and heavy duty storage platforms.
5. Finish: Indicated on the Drawings or selected by the Architect.
6. Accessories: Provide stops to prevent accidental removal.

F. Shelf Brackets:

1. Description: Spoon-shaped 1/4-inch nickel-plated steel shelf supports.
2. Product: "Item No. 282.04.739" manufactured by Häfele America Co., or equal.

G. Locks:

1. Description: Cylinder locks that separate the lock core from the cylinder housing, allowing any combination of locking systems.
2. Product: "Cylinder Module System" manufactured by Häfele America Co., or equal.
3. Requisite Properties:
 - a. All cabinet doors and drawers must be lockable.
 - b. Certain areas may be keyed separate. Everywhere else must be keyed the same.
 - c. Provide master keying.

H. Grommets:

1. Standard Grommet Liner and Cap: "MM5A" solid brass grommet liner (fits a 2-7/8-inch hole) and "MM5" solid brass grommet cap (fits a 2-3/4-inch hole).
2. No Gap Small Grommets: "BRV1 Brava Grommet – Small", or equal (fits a 2-3/8-inch hole size).
3. No Gap Large Grommets: "BRV2 Brava Grommet – Large", or equal (fits a 3-5/32-inch hole size).
4. Trash Grommet: "TM-1 Steel" stainless steel trash grommet, or equal (fits a 6-inch hole size).
5. Finish: Satin Chrome.

2.5 ACCESSORIES

A. Base Cabinet Levelers:

1. Description: 2-part adjuster and separate panel with steel spring clip screw-mounted to the toe kick panel.
2. Products:
 - a. Adjuster: "Item No. 637.19.228" manufactured by Häfele America Co., or equal. (4-3/4- to 5-1/2-inch toe kick height)
 - b. Panel Clip: "Item No. 637.19.906" manufactured by Häfele America Co., or equal.

B. Fixed Shelf Brackets:

1. Description: Steel shelf supports.
2. Product: "Hebgo Bracket" manufactured by Häfele America Co., or equal.
3. Requisite Properties:

- a. Minimum Sizes: Indicated on the Drawings or selected by the Architect.
 - b. Minimum Load Capacity: At least 300 pounds per pair.
 - c. Finished: Factory primed for a field-applied finish.
- C. Counter Supports:
1. Description: Manufactured counter support brackets.
 2. Product: "Rakks EH Series - Counter Support Brackets" manufactured by Rangine Corp., or equal.
 3. Requisite Properties:
 - a. Models: "EH-1824FM".
 - b. Mounting Configuration: Flush.
 - c. Minimum Sizes: Counters up to 30 inches depth.
 - d. Surface Mount Configuration: At least 450 pounds.
 - e. Flush Mount Configuration: At least 300 pounds.
 - f. Standard Finish: Shop primed for a field-applied finish.
 - g. Custom Finish: Custom powder coat finish matching the Architect's design reference (target) sample.
- D. Wood Glue:
1. Description: Yellow aliphatic resin polyvinyl acetate (PVA) glue.
 2. Manufacturers: Provide products manufactured by one of the following, or equal.
 - a. Elmer's Products Inc.
 - b. Franklin International.
 - c. Gorilla Glue, Inc.
 3. Products: Provide the following manufactured by Franklin International, or equal.
 - a. Interior Grade Glue: "Titebond Original", or equal.
 - b. Exterior Grade Glue: "Titebond III Ultimate", or equal.
 - c. Moulding and Trim Glue: "Titebond Quick & Thick Mutisurface Glue", or equal.
- E. Construction Adhesive:
1. Description: General purpose, indoor or outdoor, drillable, moisture resistant, sandable, heavy duty construction adhesive.
 2. Product: "Titebond PROvantage" manufactured by Franklin International, or equal.
- F. Finishing Nails:
1. Description: 15-gage finish nails.
 2. Manufacturers: Provide products manufactured by one of the following, or equal.
 - a. DEWALT.
 - b. PORTER-CABLE.
 - c. SENCO.
 3. Requisite Properties:
 - a. Point Style: Chisel or diamond point.
 - b. Head Style: Brad.

- c. Interior Application Finish: Electro-galvanized.
 - d. Exterior Application Finish: Stainless steel.
 - e. Coating: Sencote.
- G. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the fabricator for actual in-service conditions applicable to the project.
- H. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.6 FABRICATION

- A. Fabricate items to the dimensions, profiles, and details shown, and in conformance with the specified quality standards requirements, unless otherwise noted or indicated.
- 1. Shop-assemble work in as large units as practicable to minimize field cutting and jointing.
 - 2. Where necessary to fit at the project site, allow ample allowance for cutting and fitting. Create sufficient scribe where items intersect walls and partitions.
 - 3. Conceal means of fastening various items together.
 - 4. Assemblies must be free from open joints, hammer and machine marks, structural defects, and surface blemishes.
- B. Finish Hardware:
- 1. Accurately fit hardware and install in conformance with the manufacturer's instructions.
 - 2. Accurately fit doors and drawers with uniform clearance at all edges.
 - 3. Doors and drawers must operate freely, but not loosely, without sticking or binding, with all hardware adjusted and functioning properly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify that in-place construction satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
- 1. Identify deficient and non-conforming project conditions.

2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for casework installation.
2. Set casework true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Fit exposed connections accurately to form flush hairline joints

B. Special Techniques:

1. Install casework in a manner consistent with the specified grade; and plumb, level, true, and straight with no distortions.
2. Shim using concealed shims.
3. Secure to ground, stripping, and blocking with countersunk, concealed fasteners and blind nailing as required for a satisfactory installation.
4. At gypsum board construction, anchor through wall surface to wood blocking or wood studs only.
5. Furnish fillers, closures and trim as required for a complete installation. Scribe in place where required.

C. Interface with Adjacent Items:

1. Provide materials, components, and accessories normally furnished or necessary to securely attach casework to supporting construction.
2. Casework taller than 42 inches must be seismically anchored.

D. Installation Tolerances: Install casework to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 ADJUSTING

- A. Verify smooth and quiet door, drawer, and finish hardware operation.
- B. Lubricate and adjust operating parts and finish hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.
- C. Rehang or replace doors, drawers, and finish hardware that do not operate freely in a safe and reliable manner.

3.5 CLEANING

- A. Cleaning Work: Remove from exposed casework surfaces anything that might interfere with uniform oxidation or weathering. Clean all visible casework surfaces in a manner that does not result in any warranty or guarantee becoming void.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed casework in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything in, on, adjacent to, or against installed casework unless it is protected from damage. Do not use installed casework as work surfaces.

- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 06 64 23 – DECORATIVE POLYMER PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Decorative polymer panels.
 2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

- A. Definitions:
1. Manufacturer: Means the decorative polymer panels manufacturer, unless otherwise indicated.
 2. Fabricator: Means the decorative polymer panel fabricator, unless otherwise indicated.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Samples: Submit at least 8-inch square representative samples of each polymer panel type, color, finish, and variety.
- B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Decorative polymer panels must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
1. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 2. Items provided for each different installation must be obtained from the same source and manufacturer.

B. Qualifications:

1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing decorative polymer panels installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have at least 5 years' experience installing decorative polymer panels for at least 30 previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must have at least 7 years' experience installing decorative polymer panels for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading decorative polymer panel installers.

1.5 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective polymer panels with undamaged new polymer panels that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 DECORATIVE POLYMER PANELS

- A. Product: "Varia Ecoresin" manufactured by 3form, Inc., or equal.
- B. Requisite Properties:
 - 1. Color: Indicated on the Drawings.
 - 2. Panel Size: Indicated on the Drawings.
 - 3. Thickness: 1/2-inch.
 - 4. Surface Finish:
 - a. Front:
 - b. Back:
 - 5. Edge finish: Sanded and smooth edges.
 - 6. Attachment Method: Stand-offs, diameter & finish indicated on the Drawings or selected by the Architect, or equal.

2.2 ACCESSORIES

- A. Fasteners: Provide fasteners supplied, required, recommended, approved, or accepted by the manufacturer.
- B. Cleaner: Supplied, required, recommended, or accepted by the manufacturer for use on installed decorative polymer panels and actual in-service conditions applicable to the project. Cleaners must remove stains, dirt, and residue without damaging or altering decorative polymer panel surfaces.
- C. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install decorative polymer panels using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set decorative polymer panels true to line; plumb, level, and square without warp or rack; with flush, well-fitted joints; and in alignment with adjacent construction.
3. Completed work must match approved samples, as accepted by the Architect.
4. Installed decorative polymer panels must be warrantable. Do not install, correct, or replace decorative polymer panels in a manner that is un-warrantable by the manufacturer; or that results in any warranty or guarantee becoming void.

B. Installation Tolerances: Install decorative polymer panels to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: Clean all visible decorative polymer panel surfaces in a manner that does not result in any warranty or guarantee becoming void. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
 - 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 - 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 - 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 - 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed decorative polymer panels in place from deterioration and damage until Substantial Completion.
- B. Do not store anything adjacent to or against installed decorative polymer panels unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed decorative polymer panels surfaces as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 07

THERMAL AND MOISTURE PROTECTION

SECTION 07 24 19 – EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior insulation and finish system.
2. Installation materials.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. EIFS: Exterior Insulation and Finish System.

B. Definitions:

1. Manufacturer: Means the EIFS manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:

1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed EIFS. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

B. Scheduling:

1. Insulation Aging: Insulation board must be aged a at least of 6 weeks before installation.

2. Adhesive Curing: Insulation adhesive must cure for at least 2 days to achieve full adhesive bond strength before beginning finish EIFS leveling and finish coat installation.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 1. Product Data:
 - a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 - b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
 2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
 3. Samples: Submit at least 18-inch square representative color stepped samples of each EIFS type, color, finish with typical trim and joints intersecting at the center of each sample. Stepped samples must include each coat or layer, including prime coat, separately identified by manufacturer's name, and product name or stock number.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished EIFS.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
- C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
 1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Plaster must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications:

1. Installer: Company or individuals must have at least 5 years' experience installing EIFS for at least 30 previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have at least 7 years' experience installing EIFS for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading EIFS installers.

C. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate EIFS into the mockup as part of the work of this specification section.

D. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
2. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of EIFS is made from field samples.
3. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
4. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.

1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
1. Avoid damage to packaging and containers, and contamination of contents.
 2. Rotate inventory; do not use items the shelf life of which is expired.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective EIFS materials with undamaged new EIFS materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install EIFS only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
- B. Other Conditions:
1. Substrate Tolerance: Surfaces receiving EIFS must be flat with 1/4-inch within any 10-foot radius.
 2. Deflection: Maximum of substrate deflection under positive or negative design loads must not exceed $L/360$ of span.

1.8 WARRANTY

- A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.
- B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from

date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Dryvit Systems, Inc.
 - 2. Parex USA, Inc.
 - 3. Sto Corp.

2.2 EXTERIOR INSULATION AND FINISH SYSTEM

- A. Product: Provide products manufactured by Parex USA, Inc., or equal.
- B. Requisite Properties:
 - 1. Color: Match existing.
 - 2. Texture: Match existing.

2.3 COMPONENTS

- A. Weather-Resistive Barrier:
 - 1. Description: 100-percent acrylic elastomeric air and weather-resistive barrier membrane.
 - 2. Product: "WeatherSeal" manufactured by Parex USA, Inc., or equal.
- B. Board Insulation:
 - 1. Description: At least 1.0 pound per cubic foot expanded polystyrene insulation board (bead board) conforming to ASTM C 578 Type I and having 1/4-inch deep by 1-1/2 inches wide integral pre-grooved drainage channels every 10 inches on center.
 - 2. Product: "WaterMaster Channel Board" manufactured by Parex USA, Inc., or equal.
 - 3. Requisite Properties:
 - a. Maximum Size: 2 feet by 4 feet.
 - b. Thickness: Between one and 1-1/2 inches.
 - c. Aging: Board must be aged a at least of 6 weeks before applying to wall.
- C. Reinforced Acrylic Leveling Coat:
 - 1. Description: 100-percent, acrylic polymer based, reinforced leveling coat used for enhanced crack resistance and embedding reinforcing mesh.
 - 2. Product: "Parex 121 Base Coat & Adhesive" manufactured by Parex USA, Inc., or equal.

D. Reinforcing Mesh:

1. Description: Symmetrical, interlaced open-weave alkali-resistant glass fiber fabric made with minimum 20 percent by weight alkaline resistant coating for compatibility with finish materials.
2. Products:
 - a. Standard Mesh: "355 Standard Mesh" 4.5 ounce per square yard fiberglass mesh, or equal.
 - b. Detail Mesh: "356 Short Detail Mesh" 4.5 ounce per square yard fiberglass mesh, or equal.
 - c. Corner Mesh: "357 Corner Mesh" 7.2 ounce per square yard fiberglass mesh, or equal.
 - d. Intermediate Impact Mesh: "358.10 Intermediate Impact Mesh" 12 ounce per square yard fiberglass mesh, or equal.
 - e. High Impact Mesh: "358.14 High Impact Mesh" 15 ounce per square yard fiberglass mesh, or equal.
 - f. Ultra High Impact Mesh: "358.20 Ultra High Impact Mesh" 20 ounce per square yard fiberglass mesh, or equal.
 - g. Reinforced Preformed Mesh: "360 Fast Window Mesh" fiberglass mesh, or equal.

E. Acrylic Finish Coat:

1. Description: Factory blended, 100-percent acrylic polymer-based, integral-color EIFS finish coat.
2. Products: "DPR Optimum Finish" 100-percent acrylic-based textured EIFS finish.
3. Requisite Properties:
 - a. Finish: Match existing.
 - b. Color: Match existing.

2.4 INSTALLATION MATERIALS

A. Primer:

1. Description: 100-percent acrylic-based primer.
2. Application: Used to reduce the chance of efflorescence from cement bases; to enhances the appearance and uniformity of EIFS finishes; and to improve EIFS finish coverage rates.
3. Product: "Parex USA Primer" manufactured by Parex USA, Inc., or equal.

B. Insulation Adhesive:

1. Description: 100-percent acrylic adhesive.
2. Product: "303 Sheathing Adhesive" manufactured by Parex USA, Inc., or equal.

C. Bonding Agent:

1. Description: 100-percent acrylic emulsion additive for Portland cement based products.

2. Application: Used to improve workability, handling, hydration of EIFS bases; to improve bond to concrete, masonry, and EIFS base surfaces, and bond between EIFS base and finish coat surfaces; and to increase shear bond adhesion.
 3. Product: "Adacryl Admix & Bonder" manufactured by Parex USA, Inc., or equal.
- D. Fasteners for Concrete and CMU: Provide at least 3/4-inch long hardened drive pin power-actuated fasteners (PAF) with 1/2-inch diameter galvanized disc or washer; or 9-gauge, minimum 3/8-inch diameter head, minimum 3/4-inch long concrete nails.
- E. Fasteners for Metal Framing: Provide 0.164-inch shank diameter (#8-32 UNC) by at least 1-1/4-inch-long Philips drive socket, bugle or wafer head, self-drilling stainless steel, bi-metal, duplex anti-corrosive steel, 3-coat anti-corrosive steel, or ceramic-coated anti-corrosive steel screw fasteners specified in Section 05 05 23, unless another fastener type is explicitly indicated; or is otherwise supplied, required, recommended, or accepted by the manufacturer.

2.5 ACCESSORIES

- A. Weather-Resistive Barrier Tape:
1. Description: Non-woven synthetic fiber tape.
 2. Application: Used to reinforce sheathing board joints and rough openings
 3. Product: "396 Parex USA Sheathing Tape" manufactured by Parex USA, Inc., or equal.
 4. Minimum Width: At least 4 inches at panel joints; at least 9 inches at rough openings.
- B. Liquid Flashing:
1. Application: Used to prepare and seal exterior wall rough openings and detail joints.
 2. Provide "WeatherFlash" manufactured by Parex USA, Inc., or equal.
- C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.6 MIXING

- A. Factory-Mixed Products:
1. Open EIFS packaging and containers only as required for use and mix only in designated areas.
 2. Thoroughly agitate and stir EIFS materials to a uniform and smooth consistency suitable for proper installation.
 3. Do not reduce, alter, or introduce foreign materials into EIFS, except in conformance with manufacturer's instructions and other requirements and recommendations.
- B. Site Mixing: Batch mix EIFS in conformance with manufacturer's instructions and other requirements and recommendations, using manufacturer-recommended techniques and

manufacturer-recommended mechanical mixing equipment, which must be clean and free of material from previously mixed batches before charging each subsequent batch.

1. Measure mix materials using only graduated mixing containers and calibrated mixing equipment. Shovels do not qualify as graduated mixing containers or calibrated equipment, and are prohibited from measuring or dispensing mix materials.
2. Thoroughly agitate and stir mix materials to a uniform and smooth consistency suitable for proper installation.
3. Do not reduce, alter, or introduce foreign materials into mix materials, except in conformance with manufacturer's instructions and other requirements and recommendations.
4. Do not use caked or lumpy materials; or materials that are irregular, too thick or too thin, or that are partially set.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
 2. Verify items penetrating EIFS are installed.
- C. Evaluation and Assessment:
 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

- A. Protection:
 1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and EIFS finish installation.
 2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

3. Opening Protection: Close and protect drains and other openings and penetrations to prevent intrusion or migration of liquids.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any specified or other warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install EIFS using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Securely attach EIFS trim and lath in place to supporting construction. Continuous expansion and control joints must be installed at locations in conformance with ASTM C1063 and ASTM C926.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed EIFS must be warrantable. Do not install, correct, or replace EIFS in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Provide sufficient manpower and equipment to ensure a continuous operation free of cold joints, scaffold lines, texture variations, and other objectionable conditions.
 - a. Plaster surfaces full height and width between control joints in one operation once the application of any coat has begun.
 - b. Stop EIFS at control joints, edges, or corners only.
 - c. Apply EIFS flush with metal trim members and make corners square and true.
2. Protection Measures during Application and Cure:
 - a. Protect EIFS products in conformance with manufacturer's instructions.
 - b. Protection measures must shield the completed scratch, brown and finish coat applications from direct sunlight and wind exposure (i.e., provide dark colored coverings or barriers).
 - c. The combination of curing and protection measures that are employed must prevent drying, uneven or excessive evaporation and strong natural or artificial blasts of dry air during the curing period.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed EIFS in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything adjacent to or against installed EIFS unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed EIFS as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 25 13 – SHEET WEATHER-RESISTIVE BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyethylene sheet weather-resistive barriers.
2. Asphalt-saturated sheet weather-resistive barriers.
3. Drainage plane.
4. Self-adhering sheet flashings integral to sheet weather-resistive barriers.
5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. WRB: Weather-Resistive Barrier.
2. VDR: Vapor Diffusion Retarder.
3. AB: Air Barrier.
4. UV: Ultraviolet Solar Radiation.

B. Definitions:

1. Manufacturer: Means the WRB manufacturer, unless otherwise indicated.
2. Perm: Means a U.S. perm, or unit of permeance (water vapor transmission) at a given differential in partial pressures on either side of a material or membrane. The U.S. perm is defined as one grain of water vapor per hour, per square foot, per inch of mercury. One US perm is equivalent to 0.659045 metric perms.
3. Shiner: Means lath or accessory fasteners that miss framing members.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: A preinstallation meeting is required for specified warranty.

1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, or performance of installed WRBs. Resolve each condition.

4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

B. Sequencing:

1. Install WRBs only after penetrating items are installed.
2. Install WRBs only after openings are framed.

C. Scheduling:

1. UV Exposure: Schedule installation to keep WRB exposure to UV within the manufacturer's recommended limits.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:

- a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
- b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)

2. Shop Drawings:

- a. Submit dimensioned drawings showing joints, seams, tie-ins, and dimensions, including terminations, penetrations, coves, interior and exterior corner conditions, openings, and expansion joints.
- b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished WRBs.

- a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
- b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
 3. Manufacturer's Representative Reports:
 - a. Before beginning work, request and submit reports confirming substrates are properly prepared in conformance with manufacturer's instructions and other requirements and recommendations; are acceptable and satisfactory to receive the work of this specification section; and conform to all requirements necessary to issue specified and other warranties.
 - b. During the work, request and submit reports documenting actions taken by the manufacturer's representative to verify conformance with manufacturer's instructions and other requirements and recommendations.
 - c. Upon completion, request and submit reports confirming installed roofing conforms to all requirements necessary to issue specified and other warranties.
- C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
1. WRBs must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Qualifications:
1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing WRBs installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
 2. Installer: Company or individuals must have at least 5 years' experience installing WRBs for at least 30 previous projects similar to this project in size, material, design, and complexity.
 3. Supervisors: Individuals must have at least 7 years' experience installing WRBs for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading WRB installers.

4. Manufacturer's Representative: Individuals must have at least 5 years' technical field experience performing manufacturer's services for at least 50 previous projects similar to this project in size, material, design, and complexity.
- C. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate WRBs into the mockup as part of the work of this specification section.
- D. Field Samples: Include *in-situ* mockups as part of the work of this specification section.
 1. Install at least one 100-square-foot field sample of each WRB installation to verify selections made under sample submittal and to set quality standards for installation. Demonstrate surface preparation, crack repair, and joint, and corner preparation.
 2. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
 3. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of WRB is made from field samples.
 4. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
 5. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage.
 1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
 2. Sheet products must be tightly rolled face out on a sturdy core designed for that purpose and vertically stored unless otherwise required or recommended by the manufacturer. Promptly remove and replace rolled sheet products that are flattened or distorted during shipping, unloading, or storage.
 3. If items are not stored in an enclosed location, then cover the tops and sides of stored items with securely-tied, waterproof, breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath the tarpaulin during certain environmental conditions)
 4. Incline covered items to ensure maximum drainage of accumulated moisture.
 5. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to heat, sudden changes in temperature, and UV exposure

beyond the manufacturer's limits; or exposed to other sources of deterioration and damage.

- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions:
 - 1. Do not install WRBs during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
 - 2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.
- B. Existing Conditions: Surfaces over which WRBs are installed must be dry. Install WRBs only when substrate moisture content falls within ranges required, recommended, or accepted by the manufacturer.

1.8 WARRANTY

- A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 10 years.
- B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 POLYETHYLENE SHEET WRB

- A. Description: Non-woven, non-perforated, non-absorbing, breathable spunbonded HDPE WRB that that
 - 1. resists air flow, bulk water, and wind driven rain;
 - 2. channels water and moisture to the outside of the building envelope; and

3. has a current evaluation report from the NES or ICC-ES demonstrating code compliance when installed as a WRB.
- B. Application: Installed on the exterior side of exterior building walls directly over the exterior wall sheathing as the base layer primary WRB. Windows, doors, and other openings must be flashed to this layer.
- C. Products: "Tyvek CommercialWrap" (ICC-ES Report No. ESR-2375) manufactured by E.I. DuPont de Nemours & Co. (Dupont), or equal.
- D. Requisite Properties:
1. Minimum Basis Weight: At least 2.7 ounces per square yard, when measured in conformance with TAPPI Test Method T 410.
 2. Minimum Roll Width: 10 feet.
 3. Maximum UV Exposure Limit: Cover within 365 days.
- E. Performance Requirements:
1. Maximum Water Vapor Permeance: Not more than 23 perms, when measured in conformance with ASTM E 96, Procedure A.
 2. Minimum Water Resistance: At least 280, when tested in conformance with AATCC 127.
 3. Minimum Tensile Strength: At least 35 lbf per inch, when tested in conformance with ASTM D 882.
 4. Surface-Burning Characteristics: wall surfacing having a maximum FSI Value of 10 or less and a maximum SDI Value of less than 10 (Class A), when tested in conformance with ASTM E 84.
- F. Accessories:
1. Prefabricated Penetration Flashings: Provide products manufactured by Quickflash Weatherproofing Products, Inc.
 2. Primer: Supplied, recommended, or accepted by the manufacturer for each substrate.
 3. Straight Flashing Material:
 - a. Description: 30-mil thick self-adhering flashing material with an elasticized polyethylene laminate face coated with butyl adhesive.
 - b. Application: Applied to rectangular window flanges, sill plates, corners, and joints.
 - c. Product: "StraightFlash", or equal,
 - d. UV Exposure Limit: Cover within 120 calendar days.
 4. Flexible Flashing Material:
 - a. Description: 70-mil thick self-adhering elastic flexible flashing tape with a spunbonded polyethylene laminate face coated with butyl adhesive.
 - b. Application: Applied to recessed and curved window flanges, sill plates, corners, and joints.
 - c. Product: "FlexWrap NF", or equal.
 - d. UV Exposure Limit: Cover within 120 calendar days.

5. Seam Tape:
 - a. Description: Oriented polypropylene film coated with acrylic adhesive
 - b. Product: "Tyvek Tape", or equal.
6. Fasteners:
 - a. Metal Stud Construction: "Tyvek Wrap Cap" fastening system, including "Wrap Cap Screws" and 2-inch diameter "Wrap Cap" HDPE washers.
 - b. Wood Stud Construction: "Tyvek Wrap Cap" fastening system, including #4 nails with large one-inch plastic cap fasteners.
7. Primer, Adhesive, and Other Accessories: Provide primer, adhesive, and other accessories and similar secondary items supplied, required, recommended, or accepted by the manufacturer and as necessary for a complete installation.

2.2 ASPHALT-SATURATED SHEET WRB

- A. Description: Weather-resistant building paper conforming to Federal Specification FS UU-B-790a Type I (barrier paper), Grade D (water vapor permeable), Style 2 (uncreped, not reinforced, saturated) and having a current evaluation report from the NES or ICC-ES demonstrating code compliance when installed as a WRB.
- B. Application: Installed on the exterior side of exterior building walls directly behind exterior Portland cement plaster to separate the plaster assembly from the base layer WRB.
- C. Products: Provide one of the following, or equal.
 1. "Davis Wire 60 Minute" (ICC-ES Report No. ESR-2595) manufactured by Davis Wire Corp.
 2. "Super Jumbo Tex 60 Minute" (ICC-ES Report No. ESR-1027) manufactured by Fortifiber Corp.
 3. "GMCraft 60 Minute" (ICC-ES Report No. ESR-2376) manufactured by GMC Roofing & Building Paper Products, Inc.
- D. Requisite Properties:
 1. Minimum Basis Weight: At least 6 pounds per 100 square feet (approximately 9.0 ounces per square yard).
 2. Minimum Roll Width: At least 40 inches.
 3. Maximum UV Exposure Limit: Cover within 30 days.
- E. Performance Requirements:
 1. Minimum Water Vapor Permeance: At least 5 perms, when measured in conformance with ASTM E 96, Procedure B.
 2. Minimum Water Resistance: At least 60 minutes, when tested in conformance with ASTM D 779.
 3. Minimum Tensile Strength: At least 70 lb^f per inch, when tested in conformance with ASTM D 882.

F. Accessories:

1. Fasteners: At least one-inch-long, 16-gage, pneumatically-applied, coated galvanized steel crown staples
2. Sealing Material, Repair Tape, and Other Accessories: Provide mastic, adhesive, pressure-sensitive adhesive tape, and other items supplied, required, recommended, or accepted by the manufacturer and compatible with base layer WRB where in contact.

2.3 DRAINAGE PLANE

- A. Description: Dimpled HDPE membrane ventilated rain screen with pre-installed mortar screen.
- B. Product: "Delta-Dry Stucco & Stone" manufactured by Dorken Systems, Inc, or equal.
- C. Thickness: Nominal 0.42-inch thick, unless otherwise indicated on the Drawings or selected by the Architect.

2.4 ACCESSORIES

- A. Sealant:
 1. Description: Silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25.
 2. Product: "758" manufactured by Dow Corning Corp., or equal.
 3. Color: White.
- B. Bug Screen: "DELTA-Bug Screen" manufactured by Dorken Systems, Inc., or equal.
- C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

2. Verify substrates are dry and free of deleterious and other substances that might interfere with WRB installation or performance.
3. Verify items penetrating WRBs are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install WRBs using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed WRBs must be warrantable. Do not install, correct, or replace WRBs in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Placing:
 - a. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner.
 - b. Starting at the bottom of the wall, install WRB horizontally over sheathing and securely attach with a minimum of fasteners.
 - c. Lap WRB in shingle fashion at least 3 inches at horizontal seams, and 6 inches at vertical seams. Stagger vertical joints. Shingle horizontal joints. Continuously tape all seams.
 - d. To prevent direct contact between metal lath and accessories, and to ensure water tightness, lap the WRB over flanges of plaster accessories. Continue weather barrier uninterrupted behind plaster control joints.
 - e. At areas to receive plaster provide asphalt saturated sheet WRB over base layer WRB, installed in conformance with the manufacturer's instructions.
 - f. At areas where base layer WRB might be permanently exposed to UV light, provide UV stable sheet installed in conformance with the manufacturer's instructions.
 - g. Integrate base layer WRB with flashing materials at windows, doors, and other penetrations to properly discharge water to the exterior face of the wall. Omitted or improperly installed flashing must be corrected prior to installing the WRB.
 - h. Seal all joints and penetrations through the WRB with flashing tape.

- i. Continuously tape WRB at window and door openings, and to through-wall flashings.
 2. Attachment: Fasten WRBs tight to substrates without wrinkles.
 3. Penetrations: To create an airtight seal between penetrating items and WRBs, seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating WRBs with vapor-retarder tape.
 - a. Cut WRB to fit closely and neatly.
 - b. Continuously seal edges around penetrations.
 4. Cladding Anchors: Apply 4- by 9-inch piece of approved flashing membrane to weather barrier membrane prior to the installation cladding anchors. Seal edges with weather barrier sealant.
 5. Follow polyethylene sheet WRB manufacturer's instructions for WRB installations greater than 4 stories for the primary WRB.
- C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to attach WRB tight and flat with as few fasteners as possible, and only enough to hold the WRB in place until the final wall finish material is installed.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer Services: Installed work is subject to examination by the manufacturer's representative to determine conformance to manufacturer's instructions and other requirements and recommendations. Manufacturer's field representative services are required for specified warranty.
 1. Note all defective items and non-conforming work identified by the manufacturer's representative.
 2. Itemize into a punch list all noted items and record the manufacturer's requirements and recommendations for correcting each punch list item.
 3. Promptly bring all punch list items into conformance with the manufacturer's requirements and recommendations until accepted in writing by the Architect.
 4. Manufacturer's representative withholds issuing warranties until all punch list items are accepted by the Architect.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
 1. WRB Repair: Repair tears, holes and other damage with tape; or if too large, with at least 12-inch wide strips or remnants of WRB material centered over damaged areas and at least 6 inches larger all around, whichever is greater.
 - a. Continuously tape or seal top layer edges of repair material to bottom layer.
 - b. WRB must be free from holes, tears, and punctures at the end of installation.
 2. Shiner Repair:

- a. Shiners are discovered by the installer as they miss the framing or observed from the interior before drywall is installed.
 - b. Shiners must be removed, and WRB and sheathing holes filled with compatible sealant prior to patching WRB with compatible self-adhesive flashing.
 - c. Do not leave shiners in place and seal over or rely on sealant as the only patching method.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed WRBs in place from prolonged exposure to UV manufacturer's recommended limits, exposure to weather, becoming wet, contact with damp or wet surfaces, and other sources of deterioration, and damage until covering. If exposed to UV for more than the recommended limit, then WRBs must be removed and replaced in conformance with the manufacturer's instructions.
- B. Do not store anything adjacent to or against installed WRBs unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed WRBs as work surfaces.
- C. Remove protection when it's no longer needed and before covering.

END OF SECTION

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SECTION 07 26 13 – BELOW-GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Underslab vapor diffusion retarders.
2. Installation materials.
3. Trenching repair.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. WRB: Weather-Resistive Barrier.
2. VDR: Vapor Diffusion Retarder.
3. AB: Air Barrier.
4. SASM: Self-Adhering Sheet Membrane.
5. UV: Ultraviolet Solar Radiation.
6. Definitions:
7. Manufacturer: Means the VDR manufacturer, unless otherwise indicated.
8. Perm: Means a U.S. perm, or unit of permeance (water vapor transmission) at a given differential in partial pressures on either side of a material or membrane. The U.S. perm is defined as one grain of water vapor per hour, per square foot, per inch of mercury. One US perm is equivalent to 0.659045 metric perms.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:

1. VDR manufacturer's representative and VDR installer must attend the preinstallation meeting.
2. Schedule a separate additional preinstallation meeting between the Contractor, the Architect, VDR manufacturer's representatives and VDR installers, and the entities and individuals responsible for placing concrete reinforcing and pouring concrete.
3. Hold the meeting after submittal approval and at least 10 business days before beginning installation.

4. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
5. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, or performance of installed VDRs. Resolve each condition.
6. Finalize construction schedule.
7. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

B. Sequencing: Install VDRs only after penetrating items are installed.

C. Scheduling: Schedule installation to keep VDR exposure to UV within the manufacturer's recommended limits.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data VDRs (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished VDRs.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. VDRs must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. VDRs must be obtained only from a manufacturer that sends a representative to the project site before beginning work to verify existing conditions; and during work to perform manufacturer's field services.
3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications:

1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing VDRs installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have at least 5 years' experience installing VDRs for at least 30 previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must have at least 7 years' experience installing VDRs for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading VDR installers.
4. Manufacturer's Representative: Individuals must have at least 5 years' technical field experience performing manufacturer's services for at least 50 previous projects similar to this project in size, material, design, and complexity.

- C. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate VDRs into the mockup as part of the work of this specification section.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.
1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
 2. Sheet products must be tightly rolled face out on a sturdy core designed for that purpose and vertically stored unless otherwise required or recommended by the

manufacturer. Promptly remove and replace rolled sheet products that are flattened or distorted during shipping, unloading, or storage.

3. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 4. Incline covered items to ensure maximum drainage of accumulated moisture.
 5. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective VDR materials with undamaged new VDR materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions:
1. Do not install VDRs during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
 2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
1. Fortifiber Corp.
 2. Raven Industries.
 3. Reef Industries.
 4. Stego Industries, LLC.

2.2 EXTRUDED PLASTIC VDRs

- A. Description: Virgin extruded polyolefin VDR that exceeds ASTM E 1745 requirements for minimum performance Class A VDRs.
- B. Products: “Stego Wrap (15-Mil) Vapor Barrier” manufactured by Stego Industries, LLC, or equal.
- C. Requisite Properties:
 - 1. Minimum Thickness: Actual thickness must be at least 15 mils.
 - 2. Maximum UV Exposure Limit: Cover within 30 days.
- D. Performance Requirements: VDRs must maintain performance requirements specified below after testing in conformance with ASTM E 1745, Sections 7.1.1 to 7.1.5.
 - 1. Maximum Water Vapor Permeance: Not more than 0.01 perms, when measured in conformance with ASTM F 1249.
 - 2. Minimum Tensile Strength: At least 55 pounds per inch, when measured in conformance with ASTM D 882.
 - 3. Minimum Puncture Resistance: At least 2,300 grams, when tested in conformance with ASTM D 1709, Method B.

2.3 INSTALLATION MATERIALS

- A. Seaming Tape:
 - 1. Description: 4-inch wide by at least 6-mil thick polyethylene tape with rubber-based pressure-sensitive adhesive
 - 2. Product: “Stego Tape” manufactured by Stego Industries, LLC, or equal
- B. Sealing Tape:
 - 1. Description: Non-hardening and flexible double-sided butyl rubber tape
 - 2. Applications: Used to join VDR layers together by overlapping the edges and installing tape in between; and adhere VDR to concrete walls and footings.
 - 3. Product: “StegoTack Tape” manufactured by Stego Industries, LLC, or equal.
- C. Sealant: Elastomeric sealant supplied, required, recommended, or accepted by the manufacturer, and that is both chemically and adhesively compatible with the selected VDR.

2.4 ACCESSORIES

- A. Termination Bar: “Stego Term Bar”, or equal, used for mechanically securing VDR to concrete, wood, or masonry.
- B. Concrete Bond Tape: “Stego Crete Claw”, or equal, used to seal Stego Wrap to concrete while the concrete is still wet..

- C. Mastic: "Stego Mastic", or equal, used for sealing utility and pipe penetrations.
- D. Pipe Boots: Precut pipe boots with stretchable butyl adhesive tape, or equivalent products supplied, required, recommended, approved, or accepted by the manufacturer.
- E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 - 1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
 - 2. Verify substrates are dry and free of deleterious and other substances that might interfere with VDR installation or performance.
 - 3. Verify items penetrating VDRs are installed.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install VDRs using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Installed VDRs must be warrantable. Do not install, correct, or replace VDRs in a manner that results in any warranty or guarantee becoming void.
- B. Special Techniques:

1. Repair tears, holes and other damage with tape; or if too large, with at least 12-inch wide strips or remnants of VDR material centered over damaged areas and at least 6 inches larger all around in all directions, whichever is greater.
2. Continuously tape or seal top layer edges of repair material to bottom layer.
3. VDR must be free from holes, tears, and punctures at the end of installation.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed VDRs in place from prolonged exposure to UV manufacturer's recommended limits, exposure to weather, becoming wet, contact with damp or wet surfaces, and other sources of deterioration, and damage until covering. If exposed to UV for more than the recommended limit, then VDRs must be removed and replaced in conformance with the manufacturer's instructions.
- B. Do not store anything on or adjacent to installed VDRs unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed VDRs as work surfaces.
- C. Remove protection when it's no longer needed and before covering. Examine VDR before concrete placement and repair any damages including punctures, tears, and unadhered tape.

OUTPATIENT ONCOLOGY CLINIC
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BIDDING DOCUMENTS

KYA INC.
PROJECT NO. 23043.00
04/05/2024

END OF SECTION

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SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shop- or field-fabricated flashings used for roofing and flashing applications.
2. Delegated design of flashing assemblies.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 05 50 10 for dissimilar metal corrosion protection.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. BMT: Base Metal Thickness.msg
2. HDG: Hot-Dip Galvanized.
3. MSG: Manufacturer's Standard Gage for Sheet Steel.
4. USSG: United States Standard Gage for Sheet.
5. NRCA: National Roofing Contractors Association.
6. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

B. Definitions:

1. Fabricator: Means the decorative flashing fabricator, unless otherwise indicated.
2. Manufacturers' Standard Gage for Sheet Metal: Means the thickness steel sheet based on a weight of 41.82 pounds per square foot per inch of thickness.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate installation of roof perimeter flashings with installation of roof drainage system.
2. Coordinate installation of counterflashing with installation of base flashings.
3. Coordinate installation of roof-penetration flashings with installation of roofing and other items penetrating roof.
4. Coordinate the installation of equipment support flashings with the installation of roofing and equipment.

5. Coordinate the installation of wall flashings with the installation of wall-opening components, including windows, doors, and louvers.
- B. Delegated Design Requirements:
1. Engineer, fabricate, assemble, and install flashings that conform to the profiles indicated and other Contract Document requirements; meet specified performance criteria; and results in structurally sound, non-corroding, and weathertight assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
 2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.
- C. Performance Requirements:
1. Design Pressure: Calculate in conformance with American Society of Civil Engineers/ Structural Engineering Institute publication ASCE/SEI 7, "*Minimum Design Loads and Associated Criteria for Buildings and other Structures*".
 2. Design Wind Rating:
 - a. Minimum Roof Field Area: 60 pounds per square foot.
 - b. Roof Perimeter Area: 90 pounds per square foot.
 - c. Roof Corner Area: 120 pounds per square foot.
 3. Design Negative Uplift Pressure: Coping system must conform to FMG requirements for at least a Class I-90 wind uplift rating.
 4. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
 5. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates.
- D. Preinstallation Meeting:
1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
 2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
 3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed flashings. Resolve each condition.
 4. Finalize construction schedule.
 5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data:
 - a. For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings:
 - a. Submit dimensioned plans and elevations drawn to scale and showing flashing layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
 - b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans and elevations.
 - c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
 - d. Show backings, embedments, fasteners, brackets, clips, cleats, straps, mounting devices, and other attachments.
 - e. Label each attachment type; indicate manufacturer's product name for each manufactured item.
 - f. Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
 - a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
 - b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
 - c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Quality Standard Requirements:

1. Design Standard: Comply with SMACNA publication "*Architectural Sheet Metal Manual*" requirements for design dimensions, geometry, metal thickness and other characteristics, and installation of flashings.
2. Installation Standard: Comply with NRCA publication "*Roofing and Waterproofing Manual*", Volume 2, "*Architectural Sheet Metal and Metal Roofing*" requirements for the design and installation of sheet metal flashing and trim items installed as part of roofing applications.

B. Qualifications:

1. Fabricator: Company or individuals must have at least 10 years' experience fabricating flashings installed on at least 100 previous projects similar to this project in size, material, design, and complexity
2. Installer: Company or individuals must have at least 5 years' experience installing flashings for at least 30 previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must have at least 7 years' experience installing flashings for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading flashing installers.
4. Engineer: Must be a licensed professional structural engineer registered to practice in Hawaii having at least 10 years' experience performing the kind of engineering services indicated for at least 20 previous projects similar to this project in size, material, design, and complexity.

C. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate flashing into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)

3. Incline covered items to ensure maximum drainage of accumulated moisture.
 4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective flashings with undamaged new flashings that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hot-Dip Galvanized and Galvannealed Steel Sheet: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface, coating weight designation (mass designation) indicated below on both surfaces.
1. Natural Finish (Galvanized): Provide material with at least a G90 coating weight, regular spangle, chemically treated (desired for humid-storage stain resistance; can still be painted; recommended for sheet that will be used unpainted), and oiled (intended as a corrosion inhibitor; sheet must be thoroughly cleaned to remove the oil prior to painting).
 2. Shop-Painted Finish (Galvanized): Provide material with at least a G90 coating weight, minimized spangle, chemically treated (desired for humid-storage stain resistance; can still be painted; recommended for sheet that will be used unpainted), and oiled (for enhanced formability; sheet must be thoroughly cleaned to remove the oil prior to painting).
 3. Field-Painted Finish (Galvannealed): Provide material with at least an A60 coating weight, not chemically treated, not oiled, and mill phosphatized (paint-grip finish; provides enhanced lubricating characteristics).
- B. Stainless Steel Sheet:
1. Exposed Locations: ASTM A 666 (annealed and tempered), Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 2 (half hard) temper (hardness between Rockwell B-65 and B-70; can be bent 90 degrees across the direction of rolling around a radius equal to its thickness), passivated in conformance with ASTM A 967.
 - a. Natural Finish: Furnish materials having a No. 2B (bright) finish.
 - b. Painted Finish: Furnish materials having a No. 2D (matte) finish.
 2. Concealed Locations: ASTM A 240 (annealed) Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 2 (half hard) temper (hardness between Rockwell B-65 and B-70; can be bent 90 degrees across the direction of

rolling around a radius equal to its thickness), passivated in conformance with ASTM A 967.

3. Natural Finish: Furnish materials having a No. 4 (bright) finish.
- C. Aluminum Sheet: ASTM B 209, 5005-H32 (for anodic finishing) and 3003-H14 (for painted or unfinished sheet).
- D. Pre-Painted Coated Coil and Sheet: ASTM A 755.
 1. Sheet: Aluminum sheet.
 2. Top Side Finish: 70-percent by weight liquid polyvinylidene fluoride (PVDF) coating system conforming to AAMA 2605 and consisting of a prime coat applied to a DFT of at least 0.2-mil and either a solid color coat applied to a DFT of at least 0.75-mil; or a metallic color coat applied to a DFT of at least 0.75-mil and a clear topcoat applied to a DFT of at least 0.50-mil, as indicated on the Drawings or selected by the Architect.
 3. Reverse Side Finish: 0.25-mil DFT acrylic bottom side primer and polyester wash coat (backer coat).
 4. Painted Metallic Finishes: Panels, components, and accessories having a painted metallic finish must be finished such that the metallic finish directionality (grain) of all components runs in the same direction when installed. Color variation caused by failure to comply with this requirement is rejected as non-conforming work.

2.2 ROOFING AND ROOF EDGE FLASHINGS AND TRIM

A. Description:

1. Copings: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet.
2. Gravel Stops: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet.
3. Scuppers and Conductor Heads: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet.
4. Gutters: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet.
5. Downspouts: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet.

B. Requisite Properties:

1. Profiles, Edge Styles, and Attachments: Indicated on the Drawings.
2. Joint Style: J2. (butt and backup plate)
3. Fabrication: Provide standard profiles from the SMACNA quality standard publication, Chapter 1.
 - a. Fabricate in sections between 8-and 10-feet long,
 - b. Fabricate backup plates from the same material and thickness as copings.
 - c. Miter corners, seal, mechanically fasten, and solder or weld watertight.

- d. All corners and transitions must be shop or factory fabricated. Corner pieces shall extend minimum 12 inches beyond corner in both directions.
- e. Only linear transitions may be field fabricated.
- f. Finish: Filed-applied duplex coating.

2.3 OTHER SHEET METAL FLASHINGS AND TRIM

A. Description:

- 1. Interlocking Counterflashing: Provide same material and thickness as reglets.
- 2. Through-Wall Flashings: Fabricate from at least 0.0250-inch thick (USSG 24) stainless steel sheet.
- 3. Opening Flashings in Framed Construction: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet.
- 4. Equipment Support Flashings: Fabricate from at least 0.0299-inch BMT (MSG 22) hot-dip galvanized and galvanized steel sheet.
- 5. Overhead-Piping Drip Pans: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet.
- 6. Elevator Hoistway Guards: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet.
- 7. Backpans: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvanized steel sheet, with equal coating weight on each surface, coating designation G90, not chemically treated, not oiled. Stiffen back pans as necessary to prevent "oil canning" or excessive deflection under load.
- 8. Flashings and Trim in Contact with Aluminum Components: Fabricate from at least 0.032-inch aluminum sheet.
- 9. Flashings and Trim in Contact with Concrete, Gravel, or Soil and Elsewhere Indicated: Fabricate from at least 26-ga. stainless steel Type 316 sheet.
- 10. Other Flashings and Trim: Unless otherwise noted, fabricate from at least 0.0299-inch BMT (MSG 22) hot-dip galvanized and galvanized steel sheet; or from at least 0.0250-inch (USSG 24) Type 316 stainless steel sheet.

2.4 ACCESSORIES

- A. Splash Pans: Standard precast concrete units cast from at least 4,000 pounds per square inch concrete. Precast units must have rounded corners and smooth and dense surfaces free of honeycombs.
- B. Soldering Materials:
 - 1. HDG Sheet Metal Solder and Flux: 50-percent tin solder conforming to ASTM B 32 Grade Sn50 and used with a non-corrosive flux.
 - 2. Stainless Steel Sheet Metal Solder and Flux: 60-percent tin solder conforming to ASTM B 32 Grade Sn60 and used with an acid flux.

- C. Fasteners: Provide fasteners and accessory materials suitable to the type of use and conditions of installation and service indicated; and as required for producing secure attachment to supporting construction without staining or deterioration of either the base materials or fastened materials; or deterioration of the fastener itself when in contact with base materials or fastened materials.
1. Pop rivet attachment is prohibited.
 2. Provide fasteners are made of the same material as the fastened material or have a suitable barrier protection coating.
 - a. Apply corrosion-inhibiting material (e.g., pastes, washers, compounds, etc.) under the heads of screws or bolts inserted into dissimilar metal, even if they are already treated or have a protective coating.
 - b. Washers, gaskets, and sleeves must be made of plastic or closed-cell polychloroprene (Neoprene).
 3. Verify fasteners and accessories that are galvanically compatible with fastened materials under conditions of installation and service, as demonstrated by the fastener manufacturer based on testing and field experience. Do not use fasteners that are corrosive or otherwise incompatible with fastened materials.
 4. Where fasteners are subject to loosening or turning out due to thermal and structural movements, wind loads, vibration, and other causes, provide self-locking devices that either maintain tension in the fastener assembly or remain locked even if tension in the assembly is lost. (e.g. washers, locknuts, and similar items)
 5. Exposed fasteners are prohibited on faces exposed to view. Provide concealed fasteners and expansion provisions. Where unavoidable, provide flat head cap screws (type FHCS) with drive slots filled and finished flush and smooth with adjacent surfaces.
- D. Underlayment:
1. Description: Self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/non-asphaltic butyl adhesive flashing membrane, with release liner on the adhesive side. Asphaltic adhesive flashing membranes are prohibited.
 2. Product: "Grace Ultra" manufactured by GCP Applied Technologies, or equal.
 3. Requisite Properties:
 - a. Minimum Thickness: At least 30 mils.
 - b. Minimum Roll Width: 36 inches.
 - c. Maximum UV Exposure Limit: Not more than 100 days.
 - d. Maximum High Temperature Application: Up to 300 deg F.
- E. Sealant:
1. Exposed Sealant: "756 SMS" neutral-curing silicone sealant manufactured by Dow Corning Corp., or equal conforming to ASTM C 920.
 2. Concealed Sealant: Single-component, solvent-release plasticized polyisobutylene (butyl rubber) conforming to ASTM C 1311; black color.
 3. Sheet Metal Lap Sealant: "Sikaflex 15LM" low-modulus urethane sealant manufactured by Sika Corp., or equal.
 4. Color: Selected by the Architect from the manufacturer's standard colors.

- F. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2-inch wide and 1/8-inch thick.
- G. Bituminous Coating: Cold-applied asphalt emulsion conforming to ASTM D 1187.
- H. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 FABRICATION

A. Shop Fabrication:

1. Before beginning fabrication, apply strippable film or other temporary protection normally furnished or necessary to protect metal from deterioration and damage during fabrication.
2. Fabricate items in largest sections practicable to minimize field jointing.
3. Fabricate flashing in thickness or weight needed to conform to the specified performance requirements, but not less than indicated for each application and metal.
4. Fabricate exposed work precise, straight, and true to line, size, and shape; plumb, level, and square within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.
5. Fabricate flashing without excessive oil canning, buckling, and tool marks; precise, straight, and true to line, size, shape, and levels indicated; with accurate angles and straight edges; and with exposed edges folded back to form hems.
6. Fabricate exposed connections with flush hairline joints, and square and true edges and corners.
7. Inside and outside corners, and changes in direction, must be fabricated watertight assemblies with mechanically-fastened and continuously welded or soldered joints.
8. Form non-expansion, but movable, joints in metal to accommodate sealant. Where lapped expansion provisions cannot be used, form expansion joints with at least one-inch deep intermeshing hooked flange; fill with butyl sealant concealed within joints.
 - a. Exposed fasteners are prohibited on faces exposed to view.
 - b. Provide concealed fasteners and expansion provisions elsewhere.
9. Fabricate cleats and attachment devices from the same material as the item being anchored, of sizes as recommended by the SMACNA quality standard publication for the application, but not less than thickness of metal being secured
10. Do not use graphite pencils to mark metal surfaces.

B. Fabrication Tolerances: Fabricated items must conform to the following; specified tolerances are non-cumulative.

1. Maximum Offset between Components at Joints: 1/8-inch except that at welded joints, offset are not allowed.
2. Maximum Deviation from Slope and Location Lines: 1/4-inch in 20 feet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify that in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the fabricator's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for flashing installation.
 - 2. Set flashings true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
 - 3. Shim as required with concealed shims.
 - 4. Install exposed flashings without excessive oil canning, buckling, and tool marks. Do not use graphite pencils to mark metal surfaces.
 - 5. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 6. Fit exposed connections accurately to form flush hairline joints. Trim to fit substrates and to result in watertight performance. Torch cutting is prohibited.
 - 7. Set sheet metal in bed of urethane sealant over concrete surfaces or coat with bituminous coating where compatible with overlying materials to prevent galvanic corrosion.
 - 8. Install sealant tape where indicated.
- B. Expansion Provisions: Provide provisions for thermal expansion.
 - 1. Space movement joints not more than 10 feet on center. Joints may not be located within 24 inches of corners or intersections.
 - 2. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints with intermeshing hooked flanges at least one inch deep, and fill with sealant concealed within the joints.

3. At exposed sheet metal fabrications, provide 8 in. wide splice plates. Set sheet metal laps in low-modulus urethane sealant. At sheet metal backing, provide 8-inch wide splice plates or at least 4-inch laps set in bed of low-modulus urethane sealant between pieces of sheet metal. Do not apply sealant to surface of joints.
- C. Seal joints where indicated on the Drawings and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members at least one inch into the sealant. Form joints to completely conceal sealant.
 2. When ambient temperature at the time of installation is between 40 and 70 deg. F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg. F.
 3. Prepare joints and apply sealants in conformance with Section 07 92 10.
- D. Soldered Joints:
1. Soldered joints must also be mechanically fastened
 2. Clean surfaces to be soldered.
 3. Pre-tin sheet edges to at least 1-1/2 inches from the edge; reduce pre-tinning area where the pre-tinned surface might show in the completed work.
 4. Promptly remove acid flux residue from metal after tinning and soldering. Clean and neutralize in conformance with the solder manufacturer's installation instructions.
 5. Do not use torches for soldering.
 6. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- E. Special Techniques:
1. Roof Drainage System: Install sheet metal roof drainage components as indicated to produce a complete roof drainage system conforming to the referenced standard.
 2. Roof Flashing: Install sheet metal flashing and trim in conformance with specified performance requirements, the SMACNA quality standard publication requirements. Provide concealed fasteners where possible, set units true to line, and level. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
 3. Roof Edge Flashing: Anchor to resist uplift and outward forces in conformance with the SMACNA quality standard publication and recommendations. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
 4. Copings: Anchor to resist uplift and outward forces in conformance with the SMACNA quality standard publication requirements and recommendations and roofing requirements.
 - a. Interlock exterior bottom edge of coping with continuous cleat anchored to the supporting substrate at not more than 24-inches on center.
 - b. Anchor the interior leg of copings with washers and screw fasteners through slotted holes at not more than 24 inches on center.

5. Pipe and Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
 6. Counterflashing: Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant.
 7. Roof-Penetration Flashing: Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof. All penetrations must receive umbrella flashings.
 8. Wall Flashing: Install sheet metal wall flashing as indicated, and to intercept and exclude penetrating moisture in conformance with the referenced standard's recommendations.
 9. Opening Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend beyond wall openings as indicated on the shop drawings.
 10. Miscellaneous Flashing:
 - a. Equipment Support Flashing: Weld or seal flashing with elastomeric sealant to equipment support members.
 - b. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated. Pipe and install drain lines to plumbing waste or drainage system as indicated on the plumbing drawings.
- F. Interface with Adjacent Items:
1. Provide materials, components, and accessories normally furnished or necessary to securely attach flashing to supporting construction.
 2. Provide provisions for thermal and structural movement.
 3. Space cleats not more than 12 inches apart. Anchor each cleat with at least 2 fasteners. Bend tabs over fasteners.
- G. Installation Tolerances: Shim and align flashing within an installed tolerance of 1/4-inch in 20 feet on slope and location lines indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and

3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: After installation, correction, and repair are complete, remove strippable film or other temporary protection. Promptly remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.
- C. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed flashing in place from deterioration and damage until Substantial Completion.
- B. Do not store anything on, adjacent to, or against installed flashings unless they are protected from damage. Do not use installed flashings as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 84 00 – FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Through-penetration firestop systems.
2. Fire-resistive joint systems (fire calks).
3. Perimeter fire-resistive joint systems (fire safing).
4. Surface preparation.
5. Installation materials.
6. Site tests and inspections.
7. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 81 33 for firestop putty pads.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. UL: Underwriter's Laboratories.

B. Definitions:

1. Manufacturer: Means the firestopping manufacturer, unless otherwise indicated.
2. Fire Partition Means construction designed and tested to resist the passage of fire for a prescribed time, specifically at fire barriers, fire walls, shafts, exit enclosures, smoke barriers, corridor construction and other construction assemblies.
3. L-Rating: Means the amount of air or cold smoke that can leak through a penetration, when tested in conformance with UL 1479.
4. F-Rating: Means the time a penetration firestop system prevents the passage of fire through a penetration, when tested in conformance with ASTM E 814 or UL 1479.
5. T-Rating: Means the time a firestop system, including the penetrating item, limits the maximum temperature rise to 325 deg. F above its initial temperature through the penetration on the non-fire side, when tested in conformance with ASTM E 814 or UL 1479.
6. Assembly Rating: Means the combination of T- and F-ratings in an assembly, with F equaling T, when tested in conformance with ASTM E 1966 or UL 2079.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Assisted by the selected manufacturer, choose firestopping components, products, and materials that correspond to selected firestopping systems shown by reference designations to
 - a. Underwriters Laboratories, as listed in UL publication, "*Fire Resistance Directory*".
 - b. Intertek's ETL SEMKO Division, as listed in its Omega Point Laboratories publication, "*Directory of Listed Building Products, Materials, & Assemblies*".
 2. Where modifications to tested assemblies are necessary to suit project conditions or address applications for which there are no tested systems, obtain engineering judgments from the firestopping manufacturer derived from similar qualified tested system designs and other testing.
 - a. Submit engineering judgments for review and approval and obtain written acceptance of modifications prior to submitting shop drawings to the Architect.
 - b. Engineering judgment documents must conform to International Firestop Council for Evaluating Firestop Systems Engineering Judgments requirements.
 3. Coordinate openings and penetrating items to ensure installed firestopping conforms to specified requirements and the selected firestop system testing laboratory designation.
 - a. Coordinate sizing of sleeves, openings, core-drilled holes, and cut openings to accommodate firestop systems in conformance with the manufacturer's requirements and recommendations.
 - b. Provide exposed firestopping material colors selected by the Architect from the standard color range currently available from the manufacturer. Custom colors are prohibited.
- B. Acoustical Requirements: Provide non-hardening resilient firestop material at penetrations, sleeves, and passthroughs in acoustic construction assemblies.
- C. Sequencing: After firestopping installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings: Submit project-specific key plans showing firestopping installations.
 3. Firestopping Schedule: Submit firestopping schedule indicating firestopping types, laboratory tested assembly numbers, protected elements including sizes, materials,

and minimum hourly fire-resistance rating for each fireproofed item. Cross-reference firestopping schedule to key plans.

- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished firestopping.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Firestopping must be obtained through one source from the same manufacturer (to ensure compatibility and a uniform appearance).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications:

1. Installer: Company or individuals must have at least 5 years' experience installing firestopping for at least 30 previous projects similar to this project in size, material, design, and complexity. Installers and supervisors must be
 - a. authorized, certified, licensed, or otherwise qualified by the manufacturer for at least the past 5 consecutive years as having the necessary experience, personnel, and training to install or apply the manufacturer's products, including all related components and accessories; and
 - b. approved by FM Approvals in conformance with FMG publication Class Number 4991, "*Approval Standard for Approval of Firestop Contractors*" or qualified by UL in conformance with its "*Qualified Firestop Contractor Programs*".
 - c. Only personnel trained and certified by the manufacturer in the proper installation or application techniques may supervise or perform any of the work of this specification section.
2. Supervisors: Individuals must have at least 7 years' experience installing firestopping for at least 30 previous projects similar to this project in size, material,

design, and complexity, including at least 2 years' supervisory experience directing and leading firestopping installers.

- C. Field Samples: Include *in-situ* mockups as part of the work of this specification section.
 - 1. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
 - 2. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of firestopping is made from field samples.
 - 3. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
 - 4. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 - 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 - 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
 - 1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
 - 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 - 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 - 4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
 - 1. Avoid damage to packaging and containers, and contamination of contents.
 - 2. Rotate inventory; do not use items the shelf life of which is expired.

- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective firestopping materials with undamaged new firestopping materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install firestopping only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
 - 1. Do not install firestopping during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
 - 2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.
 - 3. Do not apply firestopping when
 - a. ambient temperature is below 45 deg. F or more than 90 deg. F during application, and for at least 8 hours after;
 - b. surface temperatures are less than 40 deg. F or greater than 120 deg. F; and
 - c. surface temperatures are 5 deg. F or less above the dew point.
- B. Existing Conditions:
 - 1. Surface Conditions: Surfaces receiving firestopping must be dry. Install firestopping only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
 - 2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. 3M Fire Protection Products.
 - 2. Hilti, Inc.
 - 3. Specified Technologies, Inc.

2.2 FIRESTOPPING ASSEMBLIES

- A. Description:

1. Through-Penetration Firestop Systems: Provide firestop systems tested and identified in UL's "*Fire Resistance Directory*" product Category XHEZ, or equal.
 2. Fire-Resistive Joint Systems (fire calks): Provide firestop systems tested and identified in UL's "*Fire Resistance Directory*" product Category XHBN, or equal.
 3. Perimeter Fire-Resistive Joint Systems (safing insulation): Provide firestop systems tested and identified in UL's "*Fire Resistance Directory*" product Category XHDG, or equal.
- B. Requisite Properties:
1. F-Rated Firestop Systems: Provide firestop systems in fire partitions having an F rating that meets or exceeds the fire-resistance rating of the penetrated construction, but not less than one-hour.
 2. T-Rated Firestop Systems: In fire-resistive floor-ceiling or roof-ceiling construction, or other constructions where penetrating items pass through occupied areas and may contact combustible materials, provide firestop systems having both an F- and a T-rating, determined in conformance with ASTM E 814 or UL 1479. T-rated assemblies are required where the following conditions exist with exceptions.
 - a. Where firestop systems protect floor penetrations located outside of wall cavities.
 - b. Where firestop systems protect floor penetrations located outside fire-resistive shaft enclosures.
 - c. Where firestop systems protect penetrations located in fire-resistive construction containing doors required to have a temperature-rise rating.
 - d. Where firestop systems protect penetrating items larger than a 4-inch diameter nominal pipe or 16 square inches in overall cross-sectional area.
 3. L-Rated Firestop Systems: Where firestop systems are indicated in smoke barriers and elsewhere, provide penetration firestop systems with an L-rating of not more than 5.0 cubic feet per minute per square foot both at ambient temperatures and at 400 deg. F.
 4. Firestopping Exposed to Traffic, Moisture, or Physical Damage: Provide products that do not deteriorate after curing.
 5. Plumbing and Wet-Pipe Sprinkler System Piping Penetrations: Provide moisture-resistant penetration firestop systems.
 6. Penetrations with Insulated Piping: Provide penetration firestop systems that do not require piping insulation removal.
 7. Floor penetrations with Annular Spaces Exceeding 4 inches Wide and Exposed to Possible Loading and Traffic: Provide firestop systems that support floor loads involved, either by installing floor plates or by other means.
 8. Surface-Burning Characteristics: Provide firestopping having a maximum FSI Value of 0 and a maximum SDI Value of 0 (Class A), when tested in conformance with ASTM E 84.

2.3 MATERIALS

- A. Latex Sealant: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- B. Silicone Sealant: Single-component, silicone-based, neutral-curing elastomeric sealants. Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces; non-sag formulation for openings in walls and other vertical and overhead surfaces.
- C. Silicone Foam: Multicomponent, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
- D. Intumescent Putty: Non-hardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. Intumescent Blocks: Intumescent flexible block based on a two-component polyurethane foam
- G. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- H. Pillows and Bags: Reusable heat-expanding pillows and bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- I. Pre-formed Mineral Wool: Designed to fit flutes of metal decking and the gap between the top of wall and metal decking as a backer for spray material.
- J. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors, consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket, including similar devices.
- K. Pre-Installed Firestop Devices: Factory-assembled devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and cable bundles penetrating concrete floors or gypsum board walls.
- L. Metal Track Firestopping:
 - 1. Description: Top- and bottom-of-wall metal tracks to fills gaps between the metal and concrete surfaces and help seal out fire and smoke sound drafts.
 - 2. Product: "Firestop Top Track Seal CFS-TTS" manufactured by Hilti, or equal.
- M. Fire Rated Cable Pathways:
 - 1. Description: Gangable device modules consisting of steel raceways with intumescent foam pads requiring no additional action to achieve fire and leakage ratings, including plugs, twisting closure, putty, pillow, or sealant.

2. Products: "EZ-PATH Series 44+ Fire Rated Pathway" manufactured by Specified Technologies, Inc., or equal.
3. Requisite Properties:
 - a. Size: 4 inches wide by 4-5/8 inches high by 14 inches long.
 - b. Material: 0.059-inch BMT (MSG 18) galvanized steel sheet.

2.4 ACCESSORIES

- A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MIXING

- A. Open firestopping containers only as required for use and mix only in designated areas.
- B. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.
- C. Do not reduce, alter, or introduce foreign materials into firestopping, except in conformance with manufacturer's instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
 2. Verify substrates are dry and free of deleterious and other substances that might interfere with firestopping adhesion, appearance, or performance.
- C. Evaluation and Assessment:
 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and firestopping installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

- #### B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install firestopping using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install firestopping under conditions that ensure finishes are free from blemishes and defects.
3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Fireproofing surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
4. Do not exceed the application rates recommended by the manufacturer.
5. Completed work must match approved samples and mockups, as accepted by the Architect.
6. Installed firestopping must be warrantable. Do not install, correct, or replace firestopping in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Prime substrates as required, recommended, approved, or accepted by the manufacturer, using the manufacturer's recommended products and methods.
 - a. Confine primers to bond areas.
 - b. Do not allow spillage and migration onto exposed surfaces
2. Install forming, damming, and backing materials and other accessories as required to support fill materials during installation in the positions needed to produce cross-sectional shapes and depths required for indicated fire ratings.
3. Verify wet film thickness of firestopping during application by taking numerous measurements with a wet film gage.
4. After installing fill materials and allowing them to fully cure, remove forming materials and other accessories not indicated as permanent components of the firestopping systems.
 - a. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required achieving fire-resistance ratings indicated.

- b. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
- c. Where fill materials remain exposed after installation, produce uniform finished surfaces without substrates, undercoats, marks, or stains showing through. Produce sharp and even lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Site Inspections:

1. General: Include site inspections as part of the work of this specification section. The Owner's testing and inspection agency performs inspections.
 - a. Schedule and arrange all inspections.
 - b. Coordinate all work and the final construction schedule with all inspections.
 - c. Coordinate inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.
 - d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
 - e. Arrange inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
 - f. Witness all site inspections.
 - g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
 - h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.
2. Required Inspections: Inspections are performed in conformance with the requirements of ASTM E 2174 (through penetration fire stops) and ASTM E 2393 (fire resistive joint systems and perimeter fire barriers).

3.5 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and

3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.6 CLEANING

- A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.7 PROTECTION

- A. Protect installed firestopping in place from deterioration and damage until covering firestopping or Substantial Completion.
- B. Do not store anything adjacent to or against installed firestopping unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed firestopping surfaces as work surfaces.
- C. Remove protection when it's no longer needed and before covering firestopping or Substantial Completion.

END OF SECTION

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SECTION 07 92 10 – INTERIOR JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior joint sealants.
2. Surface preparation.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 81 33 for acoustical sealants.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the sealant manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified sealants are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.

B. Performance Requirements:

1. Joint sealants must establish and maintain a continuous watertight seal without substrates staining or deterioration.
2. Sealants installed in contact with porous substrates must demonstrate testing in conformance with ASTM C 1248 resulting in no staining to porous materials identical to those indicated for this project.

C. Scheduling: Schedule cleaning to prevent dust and other contaminants from falling on freshly-applied coatings.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Samples: Submit at least 6-inch long representative samples of each sealant variety in each selected color.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished joint sealants .
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
1. Joint sealants must be obtained through one source from the same manufacturer (to ensure compatibility and a uniform appearance).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.

- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
 - 1. Avoid damage to packaging and containers, and contamination of contents.
 - 2. Rotate inventory; do not use items the shelf life of which is expired.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective sealant materials with undamaged new sealants materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install joint sealants only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
 - 1. Do not install joint sealants during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
 - 2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.
 - 3. Do not apply joint sealants when
 - a. ambient temperature is below 45 deg. F or more than 90 deg. F during application, and for at least 8 hours after;
 - b. surface temperatures are less than 40 deg. F or greater than 120 deg. F; and
 - c. surface temperatures are 5 deg. F or less above the dew point.
- B. Existing Conditions:
 - 1. Surface Conditions: Surfaces receiving joint sealants must be dry. Install joint sealants only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
 - 2. Illumination: Provide permanent lighting or illuminate work spaces to at least the same level occurring in the room or space after Final Completion.
- C. Other Conditions: Do not apply coatings where dust is generated, or liquids are sprayed; or when windy conditions exist that may cause coatings to be blown onto vegetation or other unintended surfaces.

PART 2 - PRODUCTS

2.1 INTERIOR JOINT SEALANTS

- A. Single-Component Damp Location Sealant:

1. Description: Medium or high modulus mildew-resistant silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25, Use NT, A or O sealant, as applicable.
2. Products: Provide one of the following, or equal.
 - a. "786" manufactured by Dow Corning Corp.
 - b. "Sanitary SCS 1700" manufactured by Momentive Performance Materials, Inc.
3. Colors: White or clear, as selected by the Architect.

B. General Purpose Interior Sealant:

1. Description: Siliconized acrylic-latex sealant conforming to ASTM C 834 requirements for Type OP, Grade NF classification, as required.
2. Products: Provide one of the following, or equal.
 - a. "Sonneborn Sonolac" manufactured by BASF Building Systems.
 - b. "AC-20+Silicone" manufactured by Pecora Corp.
 - c. "Tremflex 834" manufactured by Tremco, Inc.
3. Colors: Selected by the Architect from the manufacturer's standard colors.

2.2 ACCESSORIES

A. Primer and Surface Cleaners:

1. Application: Applied to enhance and strengthen sealant adhesion to porous and nonporous substrates; and help ensure proper joint preparation
2. Porous and Cementitious Surfaces: "1200 OS Primer" manufactured by Dow Corning Corp., or equal.
3. Other Surfaces: "Construction Primer P" manufactured by Dow Corning Corp., or equal.

B. Masking Tape: Provide paper masking tape manufactured by 3M, or equal, unless another kind is supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.3 MIXING

A. Open sealants containers only as required for use.

B. Do not reduce, alter, or introduce foreign materials into sealants, except in conformance with manufacturer's instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 - 1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Verify joint dimensions and joint backer sizes conform to width-to-depth ratios, neck dimensions, and surface bond areas required, recommended, or accepted by the manufacturer.
 - 3. Verify substrates are dry and free of deleterious and other substances that might interfere with joint sealant adhesion, appearance, or performance.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

- A. Protection:
 - 1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and joint sealant installation.
 - 2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
- B. Substrate Preparation:
 - 1. Prepare substrates in conformance with ASTM C 1193 and as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.
 - 2. Remove loose materials and foreign matter that may impair sealant adhesion.
 - 3. Clean and prime substrates as required, recommended, or accepted by the manufacturer, using the manufacturer's recommended products and methods.
 - a. Confine primers to bond areas.
 - b. Do not allow spillage and migration onto exposed surfaces

3.3 INSTALLATION

A. General Requirements:

1. Install joint sealants in conformance with ASTM C 1193 using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install joint sealants under conditions that ensure finishes are free from blemishes and defects.
3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Joint sealant surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work. Produce sharp and even lines and color breaks.
4. Completed work must match approved samples and mockups, as accepted by the Architect.
5. Installed joint sealants must be warrantable. Do not install, correct, or replace joint sealants in a manner that results in any warranty or guarantee becoming void.

3.4 CORRECTION AND REPAIR

- #### A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- #### B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- #### C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean sealant from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.

3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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DIVISION 08

OPENINGS

SECTION 08 12 13 – STANDARD HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal door frames.
 - 2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.
- B. Related Requirements:
 - 1. Section 08 71 00 for door hardware.

1.2 REFERENCES

- A. Abbreviations and Acronyms:
 - 1. BMT: Base Metal Thickness.
 - 2. DHI: Door Hardware Institute.
 - 3. HM: Hollow Metal.
 - 4. MSG: Manufacturer's Standard Gage.
 - 5. DI: Steel Door Institute.
- B. Definitions:
 - 1. Manufacturer: Means the door frame manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate building opening tolerances with door frame manufacturing and erection tolerances.
 - 2. Coordinate hardware preparations, handing, and reinforcement requirements and locations with the Drawings, door schedule, and selected hardware sets.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 - 1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets

- (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Door Schedule: Submit schedule showing opening identification symbols and door and frame types and sizes, including thickness, swing, fire-resistance rating label requirements, undercuts, and finishes. Use the same reference numbers for openings and details as the Drawings.
 3. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to door schedule.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished door frames.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
1. Door frames must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Quality Standard Requirements:
1. Manufacturing Tolerances: Comply with the requirements of ANSI/SDI publication ANSI/SDI A250.8, "*Recommended Specifications for Standard Steel Doors and Frames*".
 2. Door Frame Installation Standards:
 - a. Install fire-resistance rated frames in conformance with NFPA 80, "*Standard for Fire Doors and Other Opening Protectives*".
 - b. Install other frames in conformance with of ANSI A250.11, "*Recommended Erection Instructions for Steel Frames*".

3. Hardware Preparations and Reinforcement: Comply with the requirements of ANSI/SDI A250.6, "*Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames*" with reinforcing plates fabricated from the same material as door face sheets.
4. Door Hardware Installation Standards: Install door frame hardware in conformance with ANSI/DHI A115-IG, "*Installation Guide for Doors and Hardware*".

C. Qualifications:

1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing door frames installed on at least 200 previous projects similar to this project in size, material, design, and complexity. Manufacturer must be a current member of SDI.
2. Installer: Company or individuals must have at least 5 years' experience installing door frames for at least 30 previous projects similar to this project in size, material, design, and complexity. Installer must be a current member of SDI.
3. Supervisors: Individuals must have at least 7 years' experience installing door frames for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading door frame installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
 3. Across the bottom of welded frames, at least 2 removable spreader bars must be tack welded to jambs and mullions.
 4. Frames must be palletized, wrapped, or crated to provide protection during transit and site storage.
- B. Storage: Store unloaded items as shipped, upright, and indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.
- C. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.
- D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
1. Allegion PLC.
 2. ASSA ABLOY.
 3. Door Components, Inc.
 4. MPI Custom Steel Doors and Frames.
 5. Republic Doors and Frames.

2.2 STANDARD HOLLOW METAL FRAMES

- A. Description: 3-sided (open), fully welded masonry (universal) and flush drywall standard HM frames conforming to the requirements of Steel Door Institute publication SDI-100, *Recommended Specifications for Standard Steel Doors and Frames*.
- B. Products: "Steelcraft" frames manufactured by Allegion, or equal.
1. Single Egress Door HM Frames: "F-Series" frames, or equal.
 2. Double Egress Door HM Frames: "FE-Series" frames, or equal.
 3. Cross-Corridor Door HM Frames: "DE-Series" frames, or equal.
 4. Stainless Steel HM Frames: "FS-Series" frames, or equal.

2.3 COMPONENTS

- A. Materials:
1. Frames with an Uncoated Finish (Bare or Natural Finish): Fabricate from zinc coated (HDG) steel sheet or from stainless steel sheet, as indicated.
 2. Exterior Frames with a Painted Finish and Interior Frames Installed in Wet or High Humidity Locations (including shower rooms and toilet rooms): May be fabricated from either zinc-iron alloy coated (galvannealed) steel sheet or stainless steel sheet.
 3. Interior Frames Installed Elsewhere: Fabricate from uncoated CRS sheet.
 4. Sidelight and Transom Frames: Fabricate from the same material, thickness, and finish as the adjacent door frame.
- B. Material Thickness:
1. HM Frames for Level 1 and Physical Performance Level C (Standard Duty) Doors: Fabricate from at least 0.0478-inch BMT (MSG 18) uncoated and zinc-coated steel sheet; or from at least 0.0500-inch (USSG 18) stainless steel sheet.
 2. HM Frames for Level 2 (Heavy Duty) and Physical Performance Level B, and for Level 3 and Physical Performance Level B (Extra Heavy Duty) Doors: Fabricate from at least 0.0598-inch BMT (MSG 16) uncoated steel and zinc-coated steel BMT; or from at least 0.0625-inch BMT (USSG 16) stainless steel sheet.

3. HM Frames for Level 3 and Physical Performance Level B (Extra Heavy Duty) Doors: Fabricate from at least 0.0598-inch BMT (MSG 16) uncoated steel and zinc-coated steel BMT; or from at least 0.0625-inch BMT (USSG 16) stainless steel sheet.
4. HM Frames for Level 4 and Physical Performance Level A (Maximum Duty) Doors: Fabricate from at least 0.0747-inch BMT (MSG 14) uncoated and zinc-coated steel sheet, or at least 0.0781-inch (USSG 14) stainless steel sheet.
5. Other HM Frames: Fabricate from at least 0.0598-inch BMT (MSG 16) uncoated steel and zinc-coated steel BMT; or from at least 0.0625-inch BMT (USSG 16) stainless steel sheet.

C. Profiles:

1. Types: Indicated on the Drawings.
2. Throat Openings:
 - a. Butted Frames: Equal to the wall or partition type thickness minus twice the frame return dimension, unless otherwise indicated.
 - b. Wrap-Around Frames: Equal to the wall or partition thickness, unless otherwise indicated.
3. Frame Depth:
 - a. Butted Frames: Equal to the wall or partition thickness.
 - b. Wrap-Around Frames: Equal to the throat opening plus twice the frame return dimension.
4. Frame Return Dimension: 1/2-inch.
5. Backbend Dimension (Second, Double, or Drywall Return Dimension): At least 3/8-inch.
6. Backbend Type: Indicated on the Drawings.
7. Face Dimension: Provide 4-inch face dimension at heads in CMU construction where required to maintain a masonry module; provide 2-inch face dimension at jams. Provide 2-inch face dimension elsewhere, unless otherwise indicated.
8. Stop Dimension: 5/8-inch.
9. Rabbet Depth Dimension: Equal to 3/16-inch greater than the door thickness.
10. Opposite Door Rabbet Depth Dimension: 1-9/16 inches.
11. Soffit Dimension: Equal to the frame depth minus the sum of the rabbet dimensions.

D. Corners:

1. Welded HM Door Frames: Provide square-cut mitered or coped and mitered, set-up arc welded (SUA) and ground smooth, full profile welded frames (fully welded or continuously welded frames) for installation of frames as a complete unit. All corners must be watertight.
2. HM Frame Glazing Beads: Provide butted corners.

E. Hardware Preparations and Reinforcement: Provide HM frame hardware reinforcing and preparations in conformance with ANSI/SDI publications A250.6, *“Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames”* and A250.8, *“Recommended Specifications for Standard Steel Doors and Frames”*.

2.4 ACCESSORIES

- A. Head Reinforcement: For opening widths greater than 48 inches wide, provide channel or angle stiffeners fabricated from at least 0.0747-inch BMT (MSG 14) zinc coated (HDG) steel sheet or at least 0.0781-inch BMT (USSG 14) stainless steel sheet, as applicable.
- B. Anchors:
1. Masonry Anchors: Provide either 3/16-inch minimum diameter (SWG 7) galvanized carbon steel masonry wire anchors or at least 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet masonry tee anchors, as applicable.
 2. Existing Opening Anchors: Provide at least 16-gage welded pipe sleeve anchors with 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet straps designed specifically to add support for bolting frames into rough openings of an existing walls.
 3. Wood Stud Anchors: Provide either at least 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet anchors designed specifically for attachment to the wood studs of a rough opening.
 4. Metal Stud Anchors: Provide either at least 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet anchors designed specifically for attachment to the webbing of the closed steel studs built around the frame.
 5. Universal Stud Wall Anchors: Provide either at least 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet universal lock-in jamb anchors designed specifically for use in either wood or steel stud wall applications, as applicable.
 6. Base Anchors: Provide either at least 0.0598-inch (MSG 16) BMT zinc coated (HDG) steel sheet or at least 0.0625-inch BMT (USSG 16) stainless steel sheet base anchors, as applicable. Provide adjustable base anchors that allow for installation adjustment when the floor is not level.
- C. Electrical Device Requirements: Make provisions for installation of electrified hardware and door electrical devices, and arrange so that wiring is readily installed, removed, and replaced.
1. Provide cutouts and reinforcement required for installation of devices.
 2. Provide metal conduits or raceways to accommodate wiring between devices. (e.g., from electric hinge to other electric door hardware)
- D. Glazing Stops:
1. Fire-Rated Conditions: Provide 3/4-inch square channel glazing beads.
 2. Elsewhere: Provide 5/8-inch square channel glazing beads.
 3. Material Thickness: Fabricate from at least 0.0478-inch BMT (MSG 18) uncoated and zinc-coated steel sheet.
- E. Silencers: Provide loose, 1/8-inch thick by 1/2-inch wide pressure-sensitive-adhesive-backed polychloroprene (Neoprene) or ethylene propylene diene monomer (EPDM) rubber silencers for field installation. Furnish at least 3 for each strike jamb and at least 2 for double door head. Do not provide silencers where they may interfere with other seals, including smoke & draft seals.

- F. Filler: Provide material conforming to the requirements of ANSI/SDI publication A250.8, "Recommended Specifications for Standard Steel Doors and Frames". Use UL-listed materials in frames scheduled as having a fire-resistance rating.
- G. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MATERIALS

- A. Uncoated Carbon Steel Sheet:
 - 1. Frame Material: Finished CRS coil, sheet, and strip conforming to ASTM A 1008, CS Type B (commercial steel), exposed, temper rolled, regular matte surface finish (40 to 59 AA), and oiled (sheet must be thoroughly cleaned to remove the oil prior to painting).
 - 2. Hardware Reinforcements: HRS coil, sheet, and strip conforming to ASTM A 1011, CS Type B (commercial steel), as-rolled surface finish, with cut edges.
- B. Zinc-Iron Alloy Coated (Galvannealed) Steel Sheet: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface.
 - 1. Coating Weight (Mass) Designation: Provide at least a A60 (galvannealed) minimum coating weight (mass) designation.
 - 2. Surface Finish: Non-spangled matte finish.
 - 3. Surface Treatment: Provide mill phosphate surface treatment (paint-grip finish - provides enhanced lubricating characteristics).
- C. Zinc Coated (HDG) Steel Sheet: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface.
 - 1. Coating Weight (Mass) Designation: Provide at least a G90 (galvanized) minimum coating weight (mass) designation.
 - 2. Surface Finish: Provide regular spangle surface finish.
 - 3. Surface Treatment:
 - a. Exterior Frames: Provide oil over chemical surface treatment (chemical treatment desired for humid-storage stain resistance and oil treatment needed for enhanced formability).
 - b. Interior Frames: Provide oiled surface treatment (needed for enhanced formability).

2.6 FINISHES

- A. Uncoated Steel HM Frames: Provide shop-applied phosphate (paint-grip) pre-treatment and baked on rust inhibitive primer. Primer must be compatible with either field-applied paint or field-applied coating systems specified in Division 09, as applicable.

- B. Zinc Coated and Zinc-Iron Alloy Coated Steel and Stainless Steel HM Frames: Provide shop-applied bonderized pre-treatment. (not prime painted)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install door frames in conformance with the quality standards publications using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 - 3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
 - 4. Installed door frames must be warrantable. Do not install, correct, or replace door frames in a manner that results in any warranty or guarantee becoming void.
- B. Special Techniques:
 - 1. Frames: Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Install frames with removable glazing stops located on secure side of opening.
 - b. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - c. Install door silencers in frames before grouting.

- d. Provide setting spreaders, supplied by the installer, and leave intact until frames are set square and plumb within specified tolerances, and all anchors are securely attached and grouted where required.
- e. Remove frame spreader bars only after frames are properly set and secured. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
5. Ceiling Struts: Except where anchored to masonry or to other structural support at each jamb, extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame.
 - a. Bend top of struts to provide flush contact for securing to supporting construction.
 - b. Provide adjustable wedged or bolted anchorage to frame jamb members.
- C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach door frames to supporting construction.
- D. Installation Tolerances: Install frames within the following tolerance variations.
 1. Maximum Out of Square: Not more than 1/16-inch, measured at rabbet on 90 degrees from jamb perpendicular to frame head.
 2. Maximum Out of Alignment: Not more than 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Maximum Twist: Not more than 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Maximum Out of Plumb: Not more than 1/16-inch, measured on floor at jambs.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and

3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: Clean all visible door frame surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed door frames in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything adjacent to or against installed door frames unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed door frames as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 14 24 – PLASTIC LAMINATE-FACED WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. High pressure plastic laminate (HPL)-faced flush wood doors.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 08 71 00 for door hardware.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. DHI: Door Hardware Institute.
2. WDMA: Wood Door Manufacturers Association.

B. Definitions:

1. Manufacturer: Means the door manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate building opening tolerances with door manufacturing and erection tolerances.
2. Coordinate hardware preparations, handing, and reinforcement requirements and locations with the Drawings, door schedule, and selected hardware sets.
3. Coordinate door hardware finishes with other door hardware finishes.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:

- a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets

- (SDSs), both of which are returned to the Contractor without review or responsive action.
- b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Door Schedule: Submit schedule showing opening identification symbols and door and frame types and sizes, including thickness, swing, fire-resistance rating label requirements, undercuts, and finishes. Use the same reference numbers for openings and details as the Drawings.
 3. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to door schedule.
 4. Samples: Submit at least 8-inch square representative samples of each door color, finish, and variety.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished doors.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
- C. Closeout Submittals:
1. Maintenance Data: Submit copies of manufacturer's instructions and other requirements and recommendations for door maintenance, cleaning, and repair to the Architect as a condition of project closeout.
 2. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
1. Doors must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.

- b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Fire-Protection Rating: Within fire-resistance rated assemblies, provide fire-protection-rated doors conforming to NFPA 80, "*Standard for Fire Doors and Other Opening Protectives*" and tested in conformance with NFPA 252, "*Standard Methods of Fire Tests of Door Assemblies*" and UL 10B, "*Standard for Fire Tests of Door Assemblies*"; or UL 10C, "*Standard for Positive Pressure Fire Tests of Door Assemblies*" for doors at atmospheric (neutral) pressure. A label or listing mark indicating the fire-protection rating must be permanently affixed at the factory in a location such that the label remains visible after the door is installed and must include UL "S" and "Positive Pressure Test" listings.
2. Smoke-Control Door Assemblies: Provide doors conforming to the requirements of with NFPA 80, "*Standard for Fire Doors and Other Opening Protectives*" and tested in conformance with NFPA 105, "*Standard for Smoke Door Assemblies and Other Opening Protectives*" or UL 1784, "*Standard for Air Leakage Tests of Door Assemblies*".

C. Quality Standard Requirements:

1. Product Standard: Comply with the requirements Window & Door Manufacturers Association publication ANSI/WDMA I.S.1-A, "*Industry Standard for Interior Architectural Wood Flush Doors*".
2. Door Hardware Installation Standards: Install door hardware in conformance with ANSI/DHI A115-IG, "*Installation Guide for Doors and Hardware*".

D. Qualifications:

1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing doors installed on at least 200 previous projects similar to this project in size, material, design, and complexity. Manufacturer must be a current member of WDMA.
2. Installer: Company or individuals must have at least 5 years' experience installing doors for at least 30 previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must have at least 7 years' experience installing doors for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading door installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
1. Furnish adequate dunnage and bracing during storage.
 2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
 3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective doors with undamaged new doors that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

- A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 PLASTIC LAMINATE-FACED DOORS

- A. Description: Flush wood doors conforming to WDMA I.S.1-A Performance Grade Heavy Duty.
- B. Restrictions: Doors manufactured with adhesives and composite wood products containing urea formaldehyde are prohibited.
- C. Product: "Marquis Series" doors manufactured by Marshfield DoorSystems, Inc., or equal.
- D. Requisite Properties:
1. Type: Solid Core
 2. Grade: Custom.

3. Thickness: 1-3/4 inches.
4. Construction: 5-ply.
5. Core: Manufacturer's standard wood-based particleboard, structural composite lumber, agrifiber, or fire-resistant mineral core.
6. Edge Construction: Structural composite lumber or hardwood lumber stiles and rails securely bonded to core components and machine calibrated before veneering, with laminate vertical edges and laminate top and bottom rails matching laminate faces.
7. Meeting Edge: Beveled.
8. Hardware Blocking:
 - a. 5-by-18-inch lock blocks at both stiles.
 - b. 5-inch top- and bottom-rail blocking.
 - c. 2-1/2-inch mid-rail blocking.
9. Horizontal Surfaces: Structural composite lumber.
10. Openings: Cut and trim through-door openings in factory.
 - a. Light Openings: Trim openings with materials and profiles indicated.
 - b. Glazing: Factory install glazing.
 - c. Louvers: Factory install louvers in prepared openings.

2.2 PLASTIC LAMINATE FACING

- A. Description: General purpose type HPDL conforming to NEMA publication "*NEMA Standards Publication LD-3*" requirements for Grade SGF (flame-retardant) for fire-rated doors; Grade HGS (standard) for other doors. Provide laminate vertical edges and laminate top and bottom rails matching laminate faces.
- B. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.3 ACCESSORIES

- A. Vision Lights: "Vision Lite Kits" manufactured by TRUDOOR, LLC, or equal.
 1. Frames: At least at least 0.0359-inch BMT (MSG 20) uncoated steel sheet, with mitered and welded corners and countersunk mounting holes.
 2. Finish: Manufacturer's standard powder coat finish.
 3. Frame Color: Indicated on the Drawings or selected by the Architect.
- B. Privacy Control Vision Panels: "VISTA-Max" manufactured by Vistamatic, or equal.
 1. Outer Glazing Panels: 3/8-inch clear polycarbonate security glazing.
 2. Center Glazing Panel: 5/32-inch clear polycarbonate security glazing.
 3. Panel Opacity and Pattern: Natural sandblasted lines, horizontal pattern.
 4. Handle: Ligature-free knob.
 5. Fasteners: Exposed fasteners on corridor side.

C. Door Louvers:

1. Products: Provide the following manufactured by USA Fire Door LLC, or equal.
 - a. Standard Door Louvers: "800 Series", or equal, 0.0478-inch BMT (MSG 18) uncoated steel louver door inserts.
 - b. Fire-Rated Door Louvers: "1900 Series", or equal, 0.0478-inch BMT (MSG 18) uncoated steel louver door inserts.
2. Requisite Properties:
 - a. Blades: Inverted Y or Z blades.
 - b. Minimum Free Area: Between 40 and 50 percent.
 - c. Finish: Manufacturer's standard powder coat finish; custom colors selected by the Architect.

D. Electrical Device Requirements: Make provisions for installation of electrified hardware and door electrical devices, and arrange so that wiring is readily installed, removed, and replaced.

1. Provide cutouts and reinforcement required for installation of devices.
2. Provide metal conduits or raceways to accommodate wiring between devices. (e.g., from electric hinge to other electric door hardware)

E. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

F. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.

2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install doors in conformance with the quality standards publications using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
4. Installed doors must be warrantable. Do not install, correct, or replace doors in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Factory-Fitted Doors: Align in frames for uniform clearance at each edge. Hang doors to operate freely for their entire travel, but not loosely, without sticking or hinge binding, with hardware adjusted and functioning properly.
2. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach doors to supporting construction.

D. Installation Tolerances:

1. Fire-Rated Doors: Install doors with clearances in conforming to NFPA 80.
2. Smoke- Control Doors: Install doors with clearances in conforming to NFPA 105.
3. Other Doors: Install doors within the following clearance variations.
 - a. Jamb and Head: 1/8-inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8-inch plus or minus 1/16-inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 1/4-inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 1/4-inch.

3.3 ADJUSTING

A. Verify smooth and quiet door and hardware operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

- C. Rehang or replace doors that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean all visible door surfaces in a manner that does not result in any warranty or guarantee becoming void.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed doors in place from soiling, deterioration, and damage until Substantial Completion.

- B. Do not store anything adjacent to or against installed doors unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed doors as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 31 16 – ACCESS PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal access panel assemblies.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. BMT: Base Metal Thickness.

B. Definitions:

1. Manufacturer: Means the access panel manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate locations of items and equipment being accessed with access panel sizes and locations indicated on the Drawings.
2. Coordinate hardware preparations, handing, reinforcement requirements, and locations with the Drawings, access panel manufacturer, and selected hardware sets.

B. Acoustical Requirements:

1. Provide fire-rated access doors with continuous piano-style hinges at sound-rated construction.
2. Seal door flange perimeter with "S88" adhesive-backed fire and smoke gasketing manufactured by Pemko Manufacturing Co., Inc., or equal.
3. Seal entire assembly to gypsum board with acoustical sealant.
4. Include 1-1/2-inch-thick minimum insulation laminated with at least 2 pound per square foot density material such as gypsum board.

1.4 SUBMITTALS

- ##### A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs) both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings:
 - a. Submit dimensioned plans and elevations drawn to scale and showing access panel locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
 - b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.
- B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Submit manufacturer-prepared published instructions for proper installation of furnished access panels.
 2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
1. Access panels must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 3. Unload and store only inspected and accepted items.

- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective access panels with undamaged new access panels that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 METAL ACCESS PANEL AND FRAMES

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Activar Construction Products Group, Inc.
 - 2. Acudor Products, Inc.
 - 3. Karp Associates, Inc.
 - 4. Nystrom Building Products.
- B. Non-Rated Access Panels at Ceramic Tile Wall Finishes:
 - 1. Description: Flush stainless steel access panels and frames.
 - 2. Product: "JL Industries Model TMS" manufactured by Activar Construction Products Group, Inc., or equal.
 - 3. Material: Type 304, 0.0625-inch BMT (USSG 16) stainless steel frame with at least 0.0625-inch BMT (USSG 16) stainless steel door.
 - 4. Trim: At least 0.0312-inch BMT (USSG 22) stainless steel flange.
 - 5. Hinge: Concealed continuous piano hinge.
- C. Non-Rated Access Panels Elsewhere:
 - 1. Description: Flush concealed frame access panels with wallboard bead.
 - 2. Product: "JL Industries Model TMW" manufactured by Activar Construction Products Group, Inc., or equal.
 - 3. Material: At least 0.0598-inch BMT (MSG 16) cold-rolled uncoated steel sheet frame and 0.0598-inch BMT (MSG 16) cold-rolled uncoated steel sheet door.
 - 4. Trim: At least 0.0299-inch BMT (MSG 22) HDG steel sheet gypsum board tape-in bead flange.
 - 5. Hinge: Concealed continuous piano hinge.
 - 6. Finish: Manufacturer's standard shop-applied phosphate pre-treatment and baked on rust inhibitive primer for field-applied finish.

D. Fire-Resistance Rated Access Panels:

1. Description: Fire-rated and insulated concealed frame access panel with wallboard bead.
2. Product: "JL Industries Model FDW" manufactured by Activar Construction Products Group, Inc., or equal.
3. Material: At least 0.0598-inch BMT (MSG 16) cold-rolled uncoated steel sheet frame with At least 0.0359-inch BMT (MSG 20) cold-rolled uncoated steel sheet door.
4. Trim: At least 0.0299-inch BMT (MSG 22) HDG steel sheet gypsum board tape-in bead flange.
5. Insulation: At least 2-inch thick fire-resistive mineral wool insulation sandwiched between access panel faces.
6. Hinge: Concealed continuous piano hinge.
7. Finish: Manufacturer's standard shop-applied phosphate pre-treatment and baked on rust inhibitive primer for field-applied finish.

E. Requisite Properties:

1. Provide at least 24-inch square or larger panel assemblies where servicemen must access spaces through panels.
2. Elsewhere, provide at least 12-inch square panel assemblies.

F. Accessories:

1. Locking Devices:
 - a. Public Areas: Provide one mortise cylinder lock per access door. Key all locks alike, unless otherwise noted.
 - b. Other Areas: Provide flush, key-operated cam lock. Key all locks alike, unless otherwise noted.
 - c. Panels 24 inches or More in Any Dimension: Provide interior latch to permit access panel opening from inside without a key.
2. Gaskets: Apply manufacturer's optional gasketing to frames of units that do not come standard with gaskets.
3. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
4. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install access panels using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 - 3. Installed access panels must be warrantable. Do not install, correct, or replace access panels in a manner that results in any warranty or guarantee becoming void.
- B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach access panels to supporting construction.
- C. Installation Tolerances: Install access panels to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

- A. Verify smooth and quiet access panel door and hardware operation.
- B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

- C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean all visible access panel surfaces in a manner that does not result in any warranty or guarantee becoming void.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed access panels in place from soiling, deterioration, and damage until Substantial Completion.

- B. Do not store anything on or adjacent to or against installed access panels unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed access panels as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 34 00 – SPECIAL FUNCTION DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior Aluminum-Framed Top-Hung Sliding Doors
- B. Related Sections:
 - 1. Section 08 14 16 – Flush Wood Door
 - 2. Section 08 13 16 – Aluminum Doors

1.3 REFERENCES

- A. Abbreviations and Acronyms:
 - 1. ANSI – American National Standards Institute
 - a. ANSI 156.18 Materials and Finishes
 - b. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.
 - 2. BHMA – Builders Hardware Manufacturers Association
 - 3. DHI – Door and Hardware Institute
 - 4. NFPA – National Fire Protection Association
 - a. NFPA 80 – Fire Doors and Windows
 - b. NFPA 101 – Life Safety code
 - c. NFPA 105 – Smoke and Draft Control Door Assemblies
 - d. NFPA 252 – Fire Tests of Doors Assemblies
 - 5. AWS – Architectural Woodwork Standards

1.4 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components,

hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.

- D. Samples: Submit manufacturer's samples of the following sliding door components:
 - 1. Door veneer or laminate sample.
 - 2. Aluminum Frame finish sample.
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Warranty Documentation: Submit manufacturer's standard warranty.
- G. Test Reports: Submit acoustical reports or UL1784 as applicable.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door and frame used and all related accessories from one source from the same manufacturer.
- B. Regulatory Requirements: Within fire-resistance rated assemblies, provide fire-protection-rated access door assemblies conforming to NFPA 80 that are tested in compliance with NFPA 252 or UL 10B for vertical access doors and frames, and NFPA 288 for horizontal access doors and frames, performed by a qualified testing and inspecting agency, or qualified national testing organization, acceptable to AHJ.

1.6 PERFORMANCE

- A. Aluminum perimeter frames with integral acoustic seals.
- B. Soft self-closing mechanism integrated with top track.
- C. Concealed door guide.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Notify manufacturer immediately of any shipping damage.
- C. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.

4. Protect materials and finish during storage, handling, and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. AD SYSTEMS 2201 100th St. SW, Everett, WA 98204 | Website: <http://specADsystems.com> | Phone: 425-374-1360 | Attn: Estimating: estimating@specADsystems.com

2.2 INTERIOR SLIDING ALUMINUM-FRAMED DOORS AND PARTITIONS

- A. Manufacturer:
 1. Scheduled Manufacturer: ExamSlide™ High Performance Barn (Sliding) Door System by AD Systems.
 2. Acceptable Substitute: No Substitution.
- B. Specified Wall Thickness: Contractor to verify. Wall widths vary per door.
- C. Frame Profiles: Extruded aluminum frame “wrap” frame with integral vertical jamb (stile pocket).
- D. Finish:
 1. Standard: Painted Hardcoat (Kynar) Finish. Meets AAMA 2604 Standard Colors: Light Sequin 789G048.
- E. Door Leafs. All Doors to be factory machined for hardware including pilot and function holes.
 1. 1-3/4" Flush Wood Door: Reference Spec Section 08200 Wood Doors
 - a. Glazing: safety laminated glass sound
 - b. Standard stile widths are 6" with a 10" bottom rail.
- F. Door Components:
 1. Single Top Track: AD Systems extruded aluminum track by AD Systems
 2. Valances: Extruded aluminum with integral end caps
 - a. Sloped valance.
 3. Top Rollers: tandem nylon roller sized to match door weight
 4. Concealed Floor Guide: Integral Jamb floor guide by AD Systems
 5. Soft-Closer: Soft and self-closing damper mechanism at both sides of door leaf
 6. Handles:
 - a. AD Systems Standard Straight Pull: 12" long x 1" diameter. Finish: US32D Satin Stainless Steel

G. Accessories:

1. Door Locks:

- 1) Mortise Latch and Lock Options: See Door Schedule
- 2) ADA-1 Thumbturn with Key Lock & 16-inch Ladder Pull
- 3) ADA-2 Thumbturn with Indicator & 16-inch Ladder Pull
- 4) ADA-4 Self Latching - Thumbturn with Key Lock & Lever
- 5) ADA-5 Key Cylinder & 16-inch Ladder Pull
- 6) ADA-6 Thumbturn with Indicator & Lever
- 7) ADA-7 Key Cylinder & Lever
- 8) ADA-8 Egress - Thumbturn with Key Lock & Lever

b. Magnetic Lock

2. Self-Closing Spring Mechanism

3. Automatic Door Bottom for improved acoustical performance

H. Materials:

1. Hot-Rolled Steel Rods, Bars, and Shapes: ASTM A 36 (mild steel), merchant quality.
2. Uncoated Steel Coil, Sheet, and Strip: Finished cold-rolled steel coil, sheet, and strip conforming to ASTM A 1008, CS Type B (commercial steel), unexposed (interior items) and exposed, temper rolled (exterior items), regular matte finish (40 to 59 AA), mill phosphatized, tension-leveled to a flatness of 5 I-units or less.
3. Stainless Steel Sheet: ASTM A 666 (annealed and tempered), Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 4 (soft) temper (hardness not more than Rockwell B-65; can be bent flat upon itself in any direction), tension-leveled to a flatness of 5 I-units or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wall openings to receive sliding doors for plumb, level, and square. Note: Finish door operation will be affected by out of tolerance framing.
- B. Verify dimensions of wall openings.
- C. Examine surfaces to receive top and bottom guide.
- D. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.
- E. Do not begin installation until unacceptable conditions are corrected.
- F. Base of door side to be flush or minimal. Rubber Base acceptable.

3.2 INSTALLATION

- A. Install sliding doors in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install sliding doors plumb, level, square, and in proper alignment.
- C. Install sliding doors to close against walls without gaps
- D. Install sliding doors to open and close smoothly.
- E. Anchor sliding doors securely in place to supports. Required: Fire treated 2 x 6 blocking required full length of track.

3.3 ADJUSTING

- A. Adjust sliding doors for proper operation in accordance with manufacturer's instructions.
- B. Adjust sliding doors to operate smoothly without binding.
- C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- D. Completion:
 - 1. Upon completion of correction or repair, items must be free from damage , as determined by the manufacturer's field representative and the Architect.
 - 2. Arrange and pay costs for either removing and reinstalling or replacing non-conforming work; or items that are deficient, damaged or that cannot be satisfactorily corrected or repaired in a manner that both matches adjacent undamaged areas and shows no evidence of correction, repair, or refinishing, as determined by the manufacturer's field representative and the Architect.

3.4 CLEANING

- A. Clean sliding doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage materials or finish.

3.5 PROTECTION

- A. Protect installed sliding doors from damage during construction.

END OF SECTION

SECTION 08 42 29.23 – SLIDING AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following types of automatic entrances:
 - 1. Exterior and interior, single slide and bi-parting, sliding automatic entrances.
- B. Related Sections:
 - 1. Division 7 Sections for caulking to the extent not specified in this section.
 - 2. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for entrances furnished and installed separately in Division 8 Section.
 - 3. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
 - 4. Division 8 Section Glazing for materials and installation requirements of glazing for automatic entrances.
 - 5. Division 26 Sections for electrical connections provided separately, including conduit and wiring, for power to sliding automatic entrances.

1.3 REFERENCES

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
 - 1. Underwriters Laboratories (UL):
 - a. UL 325 – Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
 - 2. American National Standards Institute (ANSI) / Builders' Hardware Manufacturers Association (BHMA):
 - a. ANSI/BHMA A156.10: Standard for Power Operated Pedestrian Doors.
 - b. ANSI/BHMA A156.5: Standard for Auxiliary Locks and Associated Products
 - 3. American Society for Testing and Materials (ASTM):
 - a. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

- b. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
4. American Association of Automatic Door Manufacturers (AAADM):
5. National Fire Protection Association (NFPA):
 - a. NFPA 101 – Life Safety Code.
 - b. NFPA 70 – National Electric Code.
6. International Code Council (ICC):
 - a. IBC: International Building Code
7. Building Officials and Code Administrators International (BOCA), 1999:
8. International Organization for Standardization (ISO):
 - a. ISO 9001 - Quality Management Systems
 - b. ISO 14025 – Environmental Labels and Declarations -- Type III Environmental Declarations -- Principles and Procedures
 - c. ISO14040 – Environmental Management -- Life Cycle Assessment -- Principles and Framework
 - d. ISO 14044 – Environmental Management -- Life Cycle Assessment -- Requirements and Guidelines
 - e. ISO 21930 – Sustainability in Buildings and Civil Engineering Works -- Core Rules for Environmental Product Declarations Of Construction Products And Services
9. National Association of Architectural Metal Manufacturers (NAAMM):
 - a. Metal Finishes Manual for Architectural and Metal Products.
10. American Architectural Manufacturers Association (AAMA):
 - a. AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
 - b. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
 - c. AAMA 701 Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.
11. United Nations Central Product Classification (UNCPC):
 - a. UNCPC 4212 - Product Category Rules for Preparing an Environmental Product Declaration for Power-Operated Pedestrian Doors and Revolving Doors

B. Definitions:

1. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.
2. Safety Device: Device that prevents a door from opening or closing, as appropriate.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide automatic entrance door assemblies capable of withstanding loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Operating Range: Minus 30 deg F (Minus 34 deg C) to 130 deg F (54 deg C).

- C. Opening-Force Requirements for Egress Doors: Force shall be adjustable; but, not more than 50 lbf (222 N) required to manually set swinging egress door panel(s) in motion.
- D. Closing-Force Requirements: Not more than 30 lbf (133 N) required to prevent door from closing.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.
- C. Color Samples for selection of factory-applied color finishes.
- D. Closeout Submittals:
 - 1. Owner's Manual.
 - 2. Warranties.
- E. Reports: Based on evaluation performed by a qualified agency, for automatic entrance door assemblies.
 - 1. Environmental Product Declaration.
 - 2. Evaluation Report for compliance with IBC.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained for installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility compliant with ISO 9001.
- C. Manufacturer shall have in place a national service dispatch center providing 24 hours a day, 7 days a week, emergency call back service.
- D. Certifications: Automatic sliding door systems shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
 - 1. ANSI/BHMA A156.10.
 - 2. NFPA 101.
 - 3. UL 325 listed.
 - 4. IBC.
 - 5. BOCA.

- E. Environmental Product Declaration (EPD): EPD for automatic sliding entrances shall be certified by the manufacturer to comply with the following:
 - 1. Prepared under Product Category Rule (PCR) UNCPC 4212.
 - 2. Conform to ISO standards 14025, 14040, 14044, 21930
 - 3. Life Cycle Assessment Basis: Cradle to Gate, minimum.
- F. Source Limitations: Obtain automatic entrance door assemblies through one source from a single manufacturer.
- G. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of automatic entrance door assemblies and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- H. 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.
- I. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.7 PROJECT CONDITIONS

- A. Field Measurements: General Contractor shall verify openings to receive automatic entrance door assemblies by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Mounting Surfaces: General Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.
- C. Other trades: General Contractor shall advise of any inadequate conditions or equipment.

1.8 COORDINATION

- A. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic entrances to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of automatic entrance door assemblies with connections to power supplies.

1.9 WARRANTY

- A. Automatic Entrances shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

- B. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.
- C. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PART 2 - PRODUCTS

2.1 AUTOMATIC ENTRANCES

- A. Manufacturer: Stanley Access Technologies; Dura-Glide™ 2000 Series sliding automatic entrances.
- B. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Headers, stiles, rails, and frames: 6063-T6.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Sheet and Plate: ASTM B 209.
 - 2. Sealants and Joint Fillers: Performed under Division 7 Section "Joint Sealants".

2.2 AUTOMATIC ENTRANCE DOOR ASSEMBLIES

- A. General: Provide manufacturer's standard automatic entrance door assemblies including doors, sidelights, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.
- B. Sliding Automatic Entrances:
 - 1. Single Slide Entrances:
 - a. Configuration: One sliding leaf and one full sidelight.
 - b. Traffic Pattern: Two-way.
 - c. Emergency Breakaway Capability: Sliding leaf only.
 - d. Mounting: Between jambs.

2.3 COMPONENTS

- A. Framing Members: Manufacturer's standard extruded aluminum reinforced as required to support imposed loads.
 - 1. Nominal Size: 1 3/4 inch by 4 1/2 inch (45 by 115 mm).
 - 2. Concealed Fastening: Framing shall incorporate a concealed fastening pocket, and continuous flush insert cover, extending full length of each framing member.

- B. Stile and Rail Doors and Sidelights: Manufacturer's standard 1 ¾ inch (45 mm) thick glazed doors with extruded-aluminum tubular stile and rail members. Incorporate concealed tie-rods that span full length of top and bottom rails.
 - 1. Glazing Stops and Gaskets: Snap-on, extruded-security aluminum stops and preformed gaskets.
 - 2. Stile Design: Narrow stile; 2 inch (51 mm) nominal width.
 - 3. Bottom Rail Design: Minimum 4 inch (102 mm) nominal height.
 - 4. Muntin Bars: Horizontal tubular rail member for each door; 2 inch (51 mm) nominal width.
- C. Glazing: Furnished under Division 8 Section Glazing. All Glazing furnished under separate section shall be 1/4 inch (6 mm) tempered.
- D. Headers: Fabricated from extruded aluminum and extending full width of automatic entrance door units to conceal door operators, carrier assemblies, and roller tracks. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 - 1. Mounting: Concealed, with one side of header flush with framing.
 - 2. Capacity: Capable of supporting up to 220 lb (100 kg) per panel, up to four panels, over spans up to 14 feet (4.3 m) without intermediate supports.
- E. Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment of at least 1/8 inch (3 mm); consisting of urethane with precision steel lubricated ball-bearing wheels, operating on a continuous roller track. Support panels from carrier assembly by load wheels and anti-riser wheels with factory adjusted cantilever and pivot assembly. Minimum two ball-bearing load wheels and two anti-rise rollers for each active leaf. Minimum load wheel diameter shall be 2 1/2 inch (64 mm); minimum anti-rise roller diameter shall be 2 inch (51 mm).
- F. Thresholds: Manufacturer's standard thresholds as indicated below:
 - 1. No threshold.
- G. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
- H. Signage: Provide signage in accordance with ANSI/BHMA A156.10.

2.4 DOOR OPERATORS

- A. General: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, operation under normal traffic load for type of occupancy indicated.
- B. Electromechanical Operators: Self-contained overhead unit powered by a minimum of 1/4 horsepower, permanent-magnet DC motor with gear reduction drive, microprocessor controller; and encoder.

1. Operation: Power opening and power closing.
2. Features:
 - a. Adjustable opening and closing speeds.
 - b. Adjustable open check and close check speeds.
 - c. Adjustable hold-open time between 0 and 30 seconds.
 - d. Obstruction recycle.
 - e. On/Off switch to control electric power to operator.
 - f. Energy conservation switch that reduces door-opening width.
 - g. Closed loop speed control with active braking and acceleration.
 - h. Adjustable obstruction recycle time delay.
 - i. Self-adjusting stop position.
 - j. Self-adjusting closing compression force.
 - k. Onboard sensor power supply.
 - l. Onboard sensor monitoring.
 - m. Optional Switch to open/Switch to close operation.
 - n. Fire alarm interface, configurable to safely open or close the entrance on signal from fire alarm system.
3. Mounting: Concealed.
4. Drive System: Synchronous belt type.

- C. Electrical service to door operators shall be provided under Division 26 Electrical. Minimum service to be 120 VAC, 5 amps.

2.5 ELECTRICAL CONTROLS

- A. Electrical Control System: Electrical control system shall include a microprocessor controller and a high-resolution position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed.
1. The high-resolution encoder shall have a resolution of not less than 1024 counts per revolution. Systems utilizing external magnets and magnetic switches are not acceptable.
 2. Electrical control system shall include a 24 VDC auxiliary output rated at 1 amp.
- B. Performance Data: The microprocessor shall collect, and store performance data as follows:
1. Counter: A non-resettable counter to track operating cycles.
 2. Event Reporting: Unit shall include non-volatile event and error recording including number of occurrences of events and errors, and cycle count of most recent events and errors.
 3. LED Display: Display presenting the current operating state of the controller.
- C. Controller Protection: The microprocessor controller shall incorporate the following features to ensure trouble free operation:

1. Automatic Reset Upon Power Up.
 2. Main Fuse Protection.
 3. Electronic Surge Protection.
 4. Internal Power Supply Protection.
 5. Resettable sensor supply fuse protection.
 6. Motor Protection, over-current protection.
- D. Soft Start/Stop: A “soft-start” “soft-stop” motor driving circuit shall be provided for smooth normal opening and recycling.
- E. Obstruction Recycle: Provide system to recycle the sliding panels when an obstruction is encountered during the closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by reducing door closing speed prior to the previously encountered obstruction location, and will continue to close in check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed and operate signal is given, resetting the door to normal operation.
- F. Programmable Controller: Microprocessor controller shall be field programmable.
1. The following parameters may be adjusted:
 - a. Operating speeds and forces as required to meet specified ANSI/BHMA standard.
 - b. Adjustable and variable features specified.
 - c. Reduced opening position.
 2. Manual programming shall be available through local interface which has a two-digit display with a selection control including three push buttons.

2.6 ACTIVATION AND SAFETY DEVICES

- A. Combined Activation and Safety Sensors: Combined activation and safety sensors shall, in a single housing, detect motion and presence in accordance with ANSI/BHMA A156.10. Motion shall be detected using K-band microwave technology, presence by active infrared reflection technology.
1. Mounting Height: Up to 11.5 feet (3.5 m) above finish floor
 2. Temperature Range: Between -31°F and 131°F (-35°C to 55°C) in all environmental conditions
 3. Relays: Form C, 50V at 0.3A for both activation and safety. Hold time of less than 0.5 seconds.
 4. Detection Pattern: When detection is made in the activation zone, and the entrance opens, the safety zone shall extend through the threshold on each side; creating an X-pattern. When activation and safety zones are cleared and the entrance closes the sensor will ignore the X-pattern safety zones.
 5. Combined motion and presence sensors shall be equal to or better than X-Zone Sensor by Optex.

- B. Photoelectric Beams: In addition to the threshold sensor include a minimum of two (2) doorway holding beams. Photoelectric beams shall be pulsed infrared type, including sender receiver assemblies for recessed mounting.
- C. Presence Sensor Monitoring: Sliding automatic entrances control system shall include a means to verify the functionality of all active presence sensors in accordance with ANSI/BHMA A156.10. A detected fault shall cause automatic operation to cease until the fault is corrected.

2.7 HARDWARE

- A. General: Provide units in sizes and types recommended by automatic entrance door and hardware manufacturers for entrances and uses indicated.
- B. Emergency Breakaway Feature: Provide release hardware that allows panel(s) to swing out in direction of egress to full 90 degrees from any position in sliding mode. Maximum force to open panel shall be 50 lbf (222 N) according to ANSI/BHMA A156.10. Interrupt powered operation of panel operator while in breakaway mode.
 - 1. Emergency breakaway feature shall include at least one adjustable detent device mounted in the top of each breakaway panel to control panel breakaway force.
 - 2. Limit Arms: Limit arms shall be provided to control swing of sliding or non-sliding panels on break-out; swing shall not exceed 90 degrees. Limit arms shall be spring loaded to prevent shock, and include adjustable friction damping.
- C. Deadlocks: Manufacturer's standard deadbolt operated by exterior cylinder and interior thumb turn; with minimum 1 inch (25 mm) long throw bolt; ANSI/BHMA A156.5, Grade 1.
 - 1. Cylinders: As specified in Division 8 Section "Door Hardware."
 - 2. Hook Latch: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.
 - 3. Two-Point Locking: On bi-parting entrances, provide locking system that incorporates a device in the stile of active door leaves that automatically extends a flush bolt into overhead carrier assembly.
- D. Control Switch: Provide manufacturer's standard header mounted rocker switches and door position switch to allow for full control of the automatic entrance door. Controls to include, but are not limited to:
 - 1. One-way traffic
 - 2. Reduced Opening
 - 3. Open/Closed/Automatic
- E. Power Switch: Sliding automatic entrances shall be equipped with a two position On/Off rocker switch to control power to the door.
- F. Sliding Weather Stripping: Manufacturer's standard replaceable components complying with AAMA 701; made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

- G. Weather Sweeps: Manufacturer's standard adjustable nylon brush sweep mounted to underside of door bottom.

2.8 FABRICATION

- A. General: Factory fabricates automatic entrance door assembly components to designs, sizes, and thickness indicated and to comply with indicated standards.
 - 1. Form aluminum shapes before finishing.
 - 2. Use concealed fasteners to greatest extent possible.
 - a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - b. Reinforce members as required to receive fastener threads.
- B. Framing: Provide automatic entrances as prefabricated assemblies.
 - 1. Fabricate tubular and channel frame assemblies with manufacturer's standard mechanical or welded joints. Provide sub-frames and reinforcement as required for a complete system to support required loads.
 - 2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
 - 3. Form profiles that are sharp, straight, and free of defects or deformations.
 - 4. Prepare components to receive concealed fasteners and anchor and connection devices.
 - 5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.
- E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated.
- F. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site.

2.9 ALUMINUM FINISHES

- A. General: Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum Association for designing finishes.

- B. Class II, Clear Anodic Finish: AA-M12C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.40 mils minimum complying with AAMA 611-98, and the following:
 - 1. AAMA 607.1
 - 2. Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine conditions for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of automatic entrances. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Do not install damaged components. Fit frame joints to produce joints free of burrs and distortion. Rigidly secure non-movement joints.
- B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
 - 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
- C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.
- D. Glazing: Performed under Division 8 Section "Glazing" in accordance with sliding automatic entrance manufacturer's instructions.
- E. Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants".

3.3 FIELD QUALITY CONTROL

- A. Testing Services: Factory Trained Installer shall test and inspect each automatic entrance door to determine compliance of installed systems with applicable ANSI standards.

3.4 ADJUSTING

- A. Adjust door operators, controls, and hardware for smooth and safe operation, for tight closure, and complying with requirements in ANSI/BHMA A156.10.

3.5 CLEANING AND PROTECTION

- A. Clean glass and aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish. Comply with requirements in Division 8 Section "Glazing", for cleaning and maintaining glass.

END OF SECTION

SECTION 08 71 00 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanical and electrified door hardware
2. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

B. Section Excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

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. "Stile and Rail Wood Doors"
 - d. "Interior Aluminum Doors and Frames"
 - e. "Aluminum-Framed Entrances and Storefronts"
 - f. "Stainless Steel Doors and Frames"
 - g. "Special Function Doors"
 - h. "Entrances"
6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
7. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
8. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.2 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 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.3 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
 - a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
 - b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
 - c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
 - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
 - b. Indicate complete designations of each item required for each opening, include:
 - 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.
 - 3) Name and manufacturer of each item.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each hardware set cross-referenced to indications on Drawings.
 - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for hardware.
 - 8) Door and frame sizes and materials.
 - 9) Degree of door swing and handing.
 - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
 - a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
 - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.

- c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. 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 as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- 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.

1.4 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 and be available 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. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
 - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
 - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
 - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
 - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
 - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
4. Accessibility Requirements:
 - a. Comply with governing accessibility regulations cited in "REFERENCES" article 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.

C. Pre-Installation Meetings

1. Keying Conference
 - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2) Preliminary key system schematic diagram.
 - 3) Requirements for key control system.
 - 4) Requirements for access control.
 - 5) Address for delivery of keys.
2. Pre-installation Conference

- a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Inspect and discuss preparatory work performed by other trades.
 - c. Inspect and discuss electrical roughing-in for electrified door hardware.
 - d. Review sequence of operation for each type of electrified door hardware.
 - e. Review required testing, inspecting, and certifying procedures.
 - f. Review questions or concerns related to proper installation and adjustment of door hardware.
3. Electrified Hardware Coordination Conference:
- a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.6 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.7 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
 - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
 - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
 - a. Mechanical Warranty
 - 1) Locks
 - a) Schlage ND Series: 10 years
 - 2) Exit Devices
 - a) Von Duprin: 3 years
 - 3) Closers
 - a) LCN 4000 Series: 30 years
 - 4) Automatic Operators
 - a) LCN: 2 years
 - b. Electrical Warranty
 - 1) Locks
 - a) Schlage: 1 year
 - 2) Exit Devices
 - a) Von Duprin: 1 year
 - 3) Closers
 - a) LCN: 2 years

1.8 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 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. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
 - 1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
 - 2. Use materials which match materials of adjacent modified areas.
 - 3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
- C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- D. 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.

2.3 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Ives 5BB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
 - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
9. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.4 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives

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.

2.5 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.6 METAL ACCESS PANEL ASSEMBLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage ND series

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. Cylinders: Refer to "KEYING" article, herein.
3. 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.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.

6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. 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: RHO

2.7 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Von Duprin 6000 Series

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary resistant that are tested to a minimum endurance test of 1,000,000 cycles.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.8 KEYSWITCHES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage 650 series

B. Requirements:

1. Provide key switches capable of being configured to momentary or maintained action.
2. Provide key switches that accept a mortise cylinder. Cylinders: Refer to "KEYING" article, herein.

2.9 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage/Von Duprin PS900 Series

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified

locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.

3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
 - a. 12/24 VDC Output, field selectable.
 - b. Class 2 Rated power limited output.
 - c. Universal 120-240 VAC input.
 - d. Low voltage DC, regulated and filtered.
 - e. Polarized connector for distribution boards.
 - f. Fused primary input.
 - g. AC input and DC output monitoring circuit w/LED indicators.
 - h. Cover mounted AC Input indication.
 - i. Tested and certified to meet UL294.
 - j. NEMA 1 enclosure.
 - k. Hinged cover w/lock down screws.
 - l. High voltage protective cover.

2.10 CYLINDERS [VERIFY]

A. Manufacturers:

1. Scheduled Manufacturer and Product:
 - a. EXISTING KEY SYSTEM.

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. Refer to "KEYING" article, herein.

2.11 KEYING [VERIFY]

A. Scheduled System:

1. Existing factory registered system:
 - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
2. 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. Contact:
 - 1) Firm Name:
 - 2) Contact Person:
 - 3) Telephone:

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 or Owner's Representative 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 or Owner's Representative 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).
- 3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.

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. Scheduled Manufacturer:
 - a. Telkee

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

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.

2.14 ELECTRO-MECHANICAL AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. LCN Senior Swing

B. Requirements:

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI/BHMA A156.19.
 - a. Opening: Powered by DC motor working through reduction gears.
 - b. Closing: Spring force.
 - c. Manual, hydraulic, or chain drive closers: Not permitted.
 - d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
 - e. Cover: Aluminum.
2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 1 to 32 seconds, and logic terminal to interface with accessories, mats, and sensors.
3. Provide drop plates, brackets, and adapters for arms as required to suit details.
4. Provide motion sensors and/or actuator switches, and receivers for operation as specified. Provide weather-resistant actuators at exterior applications.
5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets. Cylinders: Refer to "KEYING" article, herein.
6. 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.

2.15 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.16 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Zero International

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.17 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

3.1 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. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Where on-site modification of doors and frames is required:
 1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
 2. Field modify and prepare existing doors and frames for new hardware being installed.
 3. When modifications are exposed to view, use concealed fasteners, when possible.
 4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
 - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
 - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 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: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- 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: Apply to head and jamb, forming seal between door and frame.
- S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 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.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 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.
- D. Hardware Sets:

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Hardware Group No. 1
 For use on Door #(s):





S7

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC		630	VON
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	POWER SUPPLY	PS902 120/240 VAC		LGR	SCS

VERIFY KEY SYSTEM. KEY TO EXISTING.
 CARD READER, POWER SUPPLY, DPS, AND WIRING BY SECURITY CONTRACTOR;
 COORDINATION ITEMS: POWER/CONDUIT/WIRING/ELECTRONIC SECURITY SYSTEM; ALL
 ACCESS CONTROL EQUIPMENT SPECIFIED UNDER SECTION 28 13 11 BY SECURITY
 CONTRACTOR.

Hardware Group No. 2
 For use on Door #(s):






R6

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE

VERIFY KEY SYSTEM. KEY TO EXISTING.

Hardware Group No. 3
 For use on Door #(s):

R4

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

VERIFY KEY SYSTEM. KEY TO EXISTING.






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Hardware Group No. 4

For use on Door #(s):

S10








QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

VERIFY KEY SYSTEM. KEY TO EXISTING.

Hardware Group No. 4A

For use on Door #(s):

S11

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	POWER SUPPLY	PS902 120/240 VAC		LGR	SCE
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC		630	VON




VERIFY KEY SYSTEM. KEY TO EXISTING.

CARD READER, POWER SUPPLY, DPS, AND WIRING BY SECURITY CONTRACTOR; COORDINATION
 ITEMS: POWER/CONDUIT/WIRING/ELECTRONIC SECURITY SYSTEM; ALL ACCESS CONTROL
 EQUIPMENT SPECIFIED UNDER SECTION 28 13 11 BY SECURITY CONTRACTOR
 VERIFY KEY SYSTEM.
 KEY TO EXISTING.

Hardware Group No. 5

For use on Door #(s):

R1

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE

VERIFY KEY SYSTEM. KEY TO EXISTING.

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Hardware Group No. 6

For use on Door #(s):

S1

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC		630	VON
1	EA	SURF. AUTO OPERATOR	9531 HL/D MS AS REQ (120/240 VAC)		ANCLR	LCN
2	EA	ACTUATOR, TOUCH	8310-853T		630	LCN
2	EA	MOUNT BOX	8310-867F			LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	KEY SWITCH	653-04 L2 12/24 VDC		630	SCE

VERIFY KEY SYSTEM. KEY TO EXISTING.

POWER SUPPLY AND WIRING BY SECURITY CONTRACTOR; COORDINATION ITEMS:
 POWER/CONDUIT/WIRING/ELECTRONIC SECURITY SYSTEM; ALL ACCESS CONTROL EQUIPMENT
 SPECIFIED UNDER SECTION 28 13 11 BY SECURITY CONTRACTOR.

Hardware Group No. 7

For use on Door #(s):

R2

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE

VERIFY KEY SYSTEM. KEY TO EXISTING.

Hardware Group No. 8

For use on Door #(s):

R3

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE

VERIFY KEY SYSTEM. KEY TO EXISTING.

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Hardware Group No. 9

For use on Door #(s):

S6

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 10

For use on Door #(s):

R5

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SLIDING DOOR SYSTEM	EXAMSLIDE SYSTEM , SECTION 08 34 00		ADS

INCLUDE HARDWARE LOCKING GROUP AD6450P.
 VERIFY ALL HARDWARE WITH AD SYSTEMS
 VERIFY KEY SYSTEM. KEY TO EXISTING.

Hardware Group No. 11

For use on Door #(s):

S3

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SLIDING DOOR SYSTEM	EXAMSLIDE SYSTEM , SECTION 08 34 00		ADS

INCLUDE HARDWARE LOCKING GROUP ELEC2 AD-11 WITH ELEC STRIKE
 VERIFY ALL HARDWARE WITH AD SYSTEMS
 VERIFY KEY SYSTEM. KEY TO EXISTING.
 CARD READER, POWER SUPPLY, DPS, AND WIRING BY SECURITY CONTRACTOR; COORDINATION
 ITEMS: POWER/CONDUIT/WIRING/ELECTRONIC SECURITY SYSTEM; ALL ACCESS CONTROL
 EQUIPMENT SPECIFIED UNDER SECTION 28 13 11 BY SECURITY CONTRACTOR.

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Hardware Group No. 12

For use on Door #(s):

S2

QTY	EA	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SLIDING DOOR SYSTEM	EXAMSLIDE SYSTEM, SECTION 08 34 00		ADS

AD SYSTEMS AUTOMOTION AUTOMATIC SLIDING DOOR

VERIFY ALL HARDWARE WITH AD SYSTEMS

VERIFY KEY SYSTEM. KEY TO EXISTING.

CARD READER, POWER SUPPLY AND WIRING BY SECURITY CONTRACTOR; COORDINATION ITEMS:

POWER/CONDUIT/WIRING/ELECTRONIC SECURITY SYSTEM; ALL ACCESS CONTROL EQUIPMENT

SPECIFIED UNDER SECTION 28 13 11 BY SECURITY CONTRACTOR.

CARD READER OR ACTUATOR ENGAGES AUTOMOTION DOOR

Hardware Group No. 13

For use on Door #(s):

S5

QTY	EA	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1		SLIDING AUTOMATIC ENTRANCE, SEE SECTION 084229	DG2000		SAT

STANLEY DURAGLIDE 3000 AUTOMATIC SLIDING DOOR

VERIFY ALL COMPONENTS WITH STANLEY ACCESS TECHNOLOGIES

CARD READER, POWER SUPPLY AND WIRING BY SECURITY CONTRACTOR; COORDINATION ITEMS:

POWER/CONDUIT/WIRING/ELECTRONIC SECURITY SYSTEM; ALL ACCESS CONTROL EQUIPMENT

SPECIFIED UNDER SECTION 28 13 11 BY SECURITY CONTRACTOR.

CARD READER OR ACTUATOR ENGAGES AUTOMOTION DOOR

Hardware Group No. 14

For use on Door #(s):

S4

QTY	EA	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SLIDING DOOR SYSTEM	EXAMSLIDE SYSTEM , SECTION 08 34 00		ADS

INCLUDEAD SYSTEMS HARDWARE GROUP AD6440I PRIVACY LOCK & SELF CLOSING OPTION.

VERIFY ALL HARDWARE WITH AD SYSTEMS






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Hardware Group No. 15

For use on Door #(s):












S8

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
2	EA	MANUAL FLUSH BOLT	FB358		626	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 (AS REQ'D)		626	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
2	EA	FLOOR STOP	FS13		626	IVE

Hardware Group No. 16

For use on Door #(s):

S9

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	AUTO FLUSH BOLT	FB41P		630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 (AS REQ'D)		626	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO		626	SCH
1	EA	COORDINATOR	COR X FL X MB		628	IVE
2	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
2	EA	FLOOR STOP	FS13		626	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	SET	MEETING STILE	8193AA-S		AA	ZER
1	EA	POWER SUPPLY	PS902 120/240 VAC		LGR	SCE
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC		630	VON

VERIFY KEY SYSTEM. KEY TO EXISTING.

CARD READER, POWER SUPPLY, DPS, AND WIRING BY SECURITY CONTRACTOR; COORDINATION
 ITEMS: POWER/CONDUIT/WIRING/ELECTRONIC SECURITY SYSTEM; ALL ACCESS CONTROL
 EQUIPMENT SPECIFIED UNDER SECTION 28 13 11 BY SECURITY CONTRACTOR

END OF SECTION

SECTION 08 81 10 – INTERIOR GLASS GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Tempered glass.
2. Fire-resistant glass ceramic material.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the primary glass manufacturer, unless otherwise indicated.
2. Fabricator: Means the secondary glass fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Performance Requirements:

1. Minimum Glass Bite Depth: At least 3/8-inch glass bite depth for 6mm (nominal 1/4-inch) monolithic lites, unless otherwise indicated.
2. Minimum Edge Clearance: At least 1/4-inch for 6mm (nominal 1/4-inch) monolithic lites, unless otherwise indicated
3. Minimum Face Clearance: At least 1/8-inch inch for 6mm (nominal 1/4-inch) monolithic lites, unless otherwise indicated.
4. Safety Glazing Requirements: Provided either fully tempered or laminated glass conforming to ANSI Z97.1 requirements for Drop Height Class A wherever safety glazing is indicated or required. Wire glass is prohibited.
5. Other Requirements: Installed glass must be free from rattle.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

2. Glazing Schedule: Submit glazing schedule indicating glazing types, locations, sizes, thicknesses, and extents.
 3. Samples: Submit at least 8-inch square representative samples of each glass type, color, finish, and variety.
- B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Glazing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
1. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 2. Items provided for each different installation must be obtained from the same source and manufacturer.
- B. Safety Glazing Certification:
1. Each pane of safety glass delivered to the project site must be furnished with a permanent identification label or mark that identifies the labeler and indicates that safety glazing material is utilized for the installation. Each label must be permanently affixed in a location such that the label remains visible after the pane of glass is installed.
 2. Each pane of tempered glass delivered to the project site must be furnished with a permanent identification label or mark etched or ceramic-fired onto the glass surface that identifies the manufacturer or fabricator and indicates that tempered glass is utilized for the installation. Each label or mark must be permanently affixed in a location such that the label or mark remains visible after the pane of glass is installed.
- C. Qualifications:
1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing glazing installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
 2. Fabricator: Company or individuals must have at least 10 years' experience fabricating glazing installed on at least 100 previous projects similar to this project in size, material, design, and complexity.
 3. Installer: Company or individuals must have at least 5 years' experience installing glazing for at least 30 previous projects similar to this project in size, material, design, and complexity.
 4. Supervisors: Individuals must have at least 7 years' experience installing glazing for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading glazing installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 - 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 - 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
 - 1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
 - 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 - 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 - 4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective glass with undamaged new glass that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 PRIMARY GLASS MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Guardian Industries Corp.
 - 2. Pilkington North America, Inc.
 - 3. PPG Industries.
 - 4. Saint-Gobain Corp.

2.2 MANUFACTURED GLASS

- A. Ultra-Clear (Low Iron) Annealed Vision Glass:

1. Description: ASTM C 1036, Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
2. Products: Provide one of the following, or equal.
 - a. "Starphire" manufactured by PPG Industries.
 - b. "UltraWhite" manufactured by Guardian Industries Corp.
 - c. "OptiWhite" manufactured by Pilkington North America, Inc.
 - d. "DIAMANT" manufactured by Saint-Gobain Glass.
3. Performance Requirements:
 - a. Visible Light Transmittance (VLT): At least 90 percent at 6mm thickness.

2.3 SECONDARY GLASS FABRICATORS

- A. Fabricators: Provide products fabricated by one of the following, or equal.
 1. Oldcastle BuildingEnvelope Corp.
 2. PPG Industries.
 3. Viracon, Inc.

2.4 TEMPERED GLASS

- A. Description: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), fabricated from ultra-clear (low iron) annealed vision glass.
- B. Minimum Surface Compression Strength: At least 10,000 pounds per square inch.
- C. Fabrication:
 1. Fabricate tempered glass by the horizontal (roller hearth) process with roll wave distortion parallel to the bottom glass edge when installed, unless otherwise indicated.
 2. Glazing materials must be free from bubbles, smoke vanes, air holes, scratches and other defects, having ground and arrised edges; provide polished edges where exposed.
- D. Source Quality Control:
 1. Individual tempered glass lites installed overhead, and floor-to-ceiling tempered glass lites installed adjacent to walking surfaces must be fully heat soak tested by the manufacturer or fabricator before delivery to the project site.
 2. Other tempered glass lites may have statistical heat soak testing performed to demonstrate nickel sulfide breakage does not exceed 0.1 percent.

2.5 FIRE-RESISTANT GLASS CERAMIC MATERIAL

- A. Description: Clear and wireless fire- and impact safety-rated glass ceramic material conforming to ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II) with high performance surface-applied fire-rated film.

- B. Products: "FireLite NT" manufactured by Technical Glass Products (TGP), or equal.
- C. Requisite Properties:
 - 1. Fire-Resistance Rating: 20 minutes to 180 minutes with fire hose test.
 - 2. Thickness: 5mm (nominal 3/16-inch).
 - 3. Surface Grade: Premium.
 - 4. Identification: Each fire-rated glazing panel must be labeled with a permanent logo indicating the name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

2.6 ACCESSORIES

- A. Shoes for Butt Joint Glazing Installations:
 - 1. Description: Brushed stainless steel wide U-channel with top load roll-in glazing gasket for 3/4" glass.
 - 2. Product: "Catalog No. NH3BSCL" manufactured by C.R. Laurence, or equal.
 - 3. Finish: Brushed stainless steel finish.
- B. Shims: Continuous shims fabricated from load-bearing, non-leaching, high-impact polystyrene.
- C. Setting Blocks: Elastomeric silicone rubber conforming to ASTM C 1115, CH9.
- D. Spacers and End Blocks: Provide the following, unless another type, hardness, class, or surface is supplied, required, recommended, authorized, sanctioned, or accepted by the glass installer.
- E. Glazing Gaskets: Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
 - 1. Firm, Dense Gaskets: Elastomeric silicone or EPDM rubber conforming to ASTM C 1115, CH7S2 unless another type, hardness, class or surface is supplied, required, recommended, approved, or accepted by the glass installer.
 - 2. Soft, Closed Cell Gaskets: ASTM C 509. Provide silicone or EPDM rubber with pre-molded corners.
- F. Cleaners, Primers, Sealers: Supplied, required, recommended, or accepted by the manufacturer or fabricator.
- G. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install glazing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set glazing true to line; plumb, level, and square without warp or rack; with flush, well-fitted joints; and in alignment with adjacent construction.
 - 3. Completed work must match approved samples, as accepted by the Architect.
 - 4. Installed glazing must be warrantable. Do not install, correct, or replace glazing in a manner that is un-warrantable by the manufacturer; or that results in any warranty or guarantee becoming void.
- B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach glazing to supporting construction.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 - 1. written descriptions of non-conforming, damaged, and defective work;

2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: Clean all visible glazing surfaces in a manner that does not result in any warranty or guarantee becoming void. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed glazing in place from deterioration and damage until Substantial Completion.
- B. Do not store anything adjacent to or against installed glazing unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed glazing surfaces as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 09

FINISHES

SECTION 09 05 16- PREPARATION OF CONCRETE SUBSTRATES FOR FINISH FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete substrate testing equipment.
2. Corrective (remedial) MVECS.
3. Surface preparation.
4. Site tests and inspections.
5. Supplementary components, accessories, and detail work normally furnished or otherwise necessary for complete testing and preparation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 03 54 16 for definition of the term "underlayment".
2. Section 09 29 00 for definition of "permanent enclosure".

1.2 RELATED DOCUMENTS

A. This specification section

1. supplements the requirements of specification sections that identify penetrants, overlays, and coverings required for the project; and
2. is used with other specification sections to produce correct and complete substrates for all actual in-service flooring conditions applicable to the project; and sound substrates for the proper and warrantable installation of all specified or selected penetrants, overlays, and coverings, including underlayment specified in Section 03 54 16.

1.3 PRICE AND PAYMENT PROCEDURES

A. Slab Remediation:

1. Without reimbursement from Owner, perform or arrange and pay costs for performing all remedial work necessary to correct and improve
 - a. defective flatwork, including areas that exceed the MVER, pH, and RH limits required, recommended, or accepted by the penetrant, overlay, and covering manufacturers; and
 - b. penetrant, overlay, and covering failures resulting from selected concrete curing methods; and coordination of, or failure to coordinate, the chemical and adhesive compatibility of selected curing compounds with all subsequent penetrants, overlays, and covering materials, including primers, adhesives, and sealants, and other installation materials.

2. For other applications, specified MVECS is excluded from the Contract and used only as a topical remediation where necessary to conform to the penetrant, overlay, and covering manufacturers' MVER, pH, and RH requirements.

B. Unit Prices:

1. Administrative Requirements:

- a. Supply unit prices in terms of dollars per square foot for complete MVECS surface preparation and installation.
- b. Specified MVECS becomes part of the Contract upon acceptance in writing by the Owner via properly-executed Change Order.

2. Measurement Procedures: Contract adjustments are made based on the net installed verifiable quantities of conforming work compared to quantities indicated on the Drawings.

3. Payment Procedures:

- a. The Owner provides payment based on actual quantities and measurements that are both placed in the work and verified by the Architect.
- b. The Owner is not required to provide additional compensation for extraneous, non-conforming, or rejected work.

C. Alternates: With input from the preventative (day-of-pour) MVECS manufacturer, preventative may be considered for certain concrete curing applications in lieu of curing compounds; and possibly in lieu of corrective MVECS products specified in this specification section.

1.4 REFERENCES

A. Abbreviations and Acronyms:

1. CC: Anhydrous Calcium Chloride.
2. ICRI: International Concrete Repair Institute.
3. MVECS: Moisture Vapor Emission Control System.
4. MVER: Moisture Vapor Emission Rate.
5. pH: Potential of Hydrogen.
6. RH: Relative Humidity.

B. Definitions:

1. Floor Preparation: Means to make flatwork surfaces ready to receive finish flooring and suitable for proper bonding of flooring and installation materials, including patching minor holes and saw cuts, sanding, sweeping, and cleaning of conforming substrates.
2. Floor Repair: Means to fix or mend non-conforming substrates suffering from damage or fault, including grinding, filling, topping, and leveling activities.
3. Moisture Vapor Emission Rate (MVER): Means the amount of moisture emitted from a substrate, expressed as the weight of condensed gas (liquid) in theoretical pounds emitted over 1,000 square feet of floor area during a 24-hour period. MVER is

commonly referred to as “pounds” (i.e., “3 pounds” or “3 lb”). Rates range from 0 to 30 pounds per 1,000 square feet per 24 hours.

4. Substrate: Means a recently-cured, hardened, newly-aged, or existing concrete substrate, including cast-in-place, sitecast, and precast concrete floor and deck assemblies, cast underlayment, toppings, repair materials, and similar items.
 - a. Floor: Means a slab-on-grade floor assembly.
 - b. Deck: Means a suspended floor or roof slab assembly.
5. Penetrant: Means any direct-applied material, product, component, accessory, or other item that can pass into or through substrate surfaces, or enter and diffuse through substrate surface cracks, pores, and other surface defects. Penetrants include water, hardeners, curing compounds, stains, penetrating repellents and sealers, non-sacrificial graffiti-resistant materials, and dry penetrants.
6. Overlay: Means any direct-applied film-forming or high-build material that covers a substrate surface, including cast decks, underlayment, and toppings; dampproofing, waterproofing, and roofing; liquid flashings and sealants; fluid-applied and flooring treatment; terrazzo flooring; and paints, coatings, and film-forming sealers; and sacrificial graffiti-resistant materials.
7. Covering: Means any direct-applied material, product, component, accessory, or other item that is adhered or bonded to a substrate surface, including tile and adhered veneer assemblies; specialty, masonry, wood, resilient and precast terrazzo flooring; carpeting; and unit paving.
8. Cladding: Means any material, product, component, accessory, or other item supported by a framework, which is attached to a sporting construction, including anchored veneer, wall and soffit panels, and exterior plaster assemblies; suspended ceiling assemblies; and free-standing elevated accessible floor and roof paver assemblies.
9. Overburden: Means all materials, components, accessories, and other items installed or placed over a cured substrate, including overlays, coverings, cladding, and vegetated plaza deck and roof assemblies.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:

1. MVECS manufacturer’s representative and MVECS installer must attend the preinstallation meeting.
2. Schedule a separate additional preinstallation meeting between the Contractor, the Architect, penetrant, overlay and covering manufacturers’ representatives and installers, the MVECS manufacturer’s representative and installer, and the entities and individuals responsible for conducting concrete substrate testing.
3. Hold the meeting after submittal approval and at least 10 business days before beginning installation.
4. During the meeting, review
 - a. substrate design and installation, including concrete mix design, water-cement ratio, slab thickness at each test location, below grade VDRs and concrete placement and pour dates;

- b. curing, sealing, or bond breaking compounds used on substrates, along with requirements and techniques used for complete removal of compounds prior to testing and floor covering installation;
 - c. trenching, including mix design, water-cement ratio, thickness, and pour dates of concrete or slurry backfill;
 - d. bonding agents selected for overlay installation or application;
 - e. primers and adhesives selected for covering installation;
 - f. qualifications of the testing agency and testing agency personnel that are scheduled to complete testing, and that interpret test results;
 - g. calibration and verification of test equipment prior to beginning each round of testing;
 - h. HVAC system operation and requirements during testing, including temperature and RH limits;
 - i. preparation of testing sites, including procedures to assure slab surfaces are free from any material or substance that may hinder the free release of moisture from the slab;
 - j. testing procedures and sequence for each test, including sequence, frequency, and location of test sites;
 - k. requirements for testing and inspection reports;
 - l. the construction schedule;
 - m. temporary procedures required to protect concrete surfaces from re-wetting after initial testing; and
 - n. redistribution of moisture within the substrate after floor coverings are applied;
5. Identify and discuss adverse or unfavorable conditions detrimental to testing and floor preparation.
 6. Finalize construction schedule.
 7. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.
- B. Quality Standards:
1. Quality Guideline: Selected concrete surface profiling, preparation, cleaning, and repair must conform to the requirements of International Concrete Repair Institute (ICRI) Guideline No. 310.2R, *"Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair"*.
 2. Installation Standard: Concrete surface preparation must conform to the requirements of Journal of Protective Coatings and Linings (JPCL) publication, *"Surface Preparation of Concrete Substrates"*.
- C. Qualifications:
1. Substrate Testing: Individuals performing substrate testing must be certified as ICRI Concrete Slab Moisture Testing Technicians, Grade 1 and current in their certification.
 2. Substrate Repair: Individuals performing substrate repair must be certified as ICRI Concrete Surface Repair Technicians, Grade 1 and current in their certification.

- D. Sequencing: Begin substrate testing only after
1. the building is enclosed with a permanent enclosure, including permanently-installed doors, windows, storefronts, curtain walls and similar opening protectives;
 2. “wet work” such as concrete work, plastering, tile installation, and gypsum board finishing are complete and cured and dried to a condition of equilibrium;
 3. testing areas are properly prepared for testing; and
 4. the HVAC system is activated, operating, and maintaining temperatures and RH at anticipated occupancy levels for at least 48 hours prior to and during testing.
 - a. If HVAC activation and operation prior to testing cannot be provided within the proposed construction schedule, then close a number of rooms or spaces where conditions can either be brought to anticipated normal conditions or into conformance with the minimum environmental parameters of the specified test standards using commercial equipment and building climate control services.
 - b. Provide a recording hygrometer to monitor and record ambient temperature and RH levels for comparison to design occupancy conditions.
- E. Scheduling:
1. Allow sufficient time in the construction schedule to permit concrete to cure and dry, without being re-wetted, for at least 90 days before beginning testing. Substrates re-wetted after initial curing must be permitted to cure and dry for at least 180 days before beginning testing.
 - a. If minimum concrete curing and drying time cannot be provided in the construction schedule, assume the specified MVECS must be incorporated into the project as a topical remediation for concrete substrates, and reflect this assumption in the project cost until otherwise directed by the Owner.
 - b. Forced drying substrates is prohibited.
 2. Allow sufficient time in the construction schedule to permit RH test sites to equalize for at least 72 hours prior to reading equilibrium RH levels.
 3. Testing must be complete and reports submitted at least one week, but not more than 3 weeks, before beginning penetrant, overlay, or covering installation or application.

1.6 SUBMITTALS

- A. Action Submittals: Before beginning the work of this specification section, including bulk purchase and delivery of products, submit to the Architect the following for responsive action (formal review and approval).
1. Product Data:
 - a. Submit a comprehensive and complete list of proposed and other items specified, required, or otherwise necessary to complete the work of this specification section, including all accessories and similar secondary items normally furnished, required, or otherwise necessary for complete repair, surface preparation, testing, and remediation.
 - b. For each item listed, submit manufacturer’s product data, specifications, typical installation details for all actual in-service conditions applicable to this project,

and any other information necessary to demonstrate conformance with the Contract Documents, excluding Material Safety Data Sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review.

- B. Informational Submittals: Submit to the Architect the following for information (for informal review: responsive action by the Architect, including formal review and approval, is not expected or required, except to record non-conformance with specified requirements).
1. Installation Instructions: Before beginning the work of this specification section, submit the following.
 - a. Submit manufacturer-prepared published instructions for the proper installation of each furnished manufactured item and accessory, including packaging, delivery, storage, handling, surface preparation, installation, adjusting, cleaning, and protection instructions and requirements.
 - b. If manufacturer-prepared published installation instructions are either unavailable or do not specifically apply to actual project conditions, then consult with the manufacturer's representative and obtain manufacturer-prepared, project-specific supplemental instructions printed on the manufacturer's company letterhead. Promptly distribute copies to the Architect for examination before beginning the work of this specification section; the Architect may have comments that lead to contract modifications, or to minor changes in the work.
 2. Test Reports: Submit facility floor plan diagrams showing area calculations and locations of each test along with measured test results for each test location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
1. American Moisture Test, Inc.
 2. Vaisala
 3. Wagner Electronics.

2.2 CONCRETE SUBSTRATE TESTING EQUIPMENT

- A. Description: Commercially produced and -packaged test kits and equipment delivered to testing sites in factory-sealed wrappings.
- B. MVER Testing Kits (CC Moisture Test Kits):
1. Description: ASTM F 1869-compliant anhydrous calcium chloride moisture vapor testing kits consisting of a sealed dish of anhydrous calcium chloride, a metering dome with gasket, and instructions.
 2. Product: "AMT Calcium Chloride Moisture Test Kit" manufactured by American Moisture Test, Inc., or equal.

3. Components:
 - a. Non-pre-weighed, non-recycled, 94-percent pure anhydrous calcium chloride sealed in air-tight dishes.
 - b. Virgin resin non-recycled plastic dome having a maximum U.S. perm rating of 0.10-perm or less.
 - c. Butyl adhesive sealant system.
 - d. Dish container size of 69mm plus or minus one millimeter; calcium chloride weight of 16 grams plus or minus one gram.

C. pH Testing Kits:

1. Description: ASTM F 710-compliant digital alkalinity-pH meter.
2. Product: "AMT Concrete Digital Alkalinity-pH Meter" manufactured by American Moisture Test, Inc., or equal.
3. Components:
 - a. Meter must return wide range (1-14) pH readings.
 - b. Provide clean distilled or deionized water.

D. RH Testing Equipment:

1. Description: ASTM F 2170-compliant temperature and RH meter, cable, RH probes, and concrete sleeves.
2. Product: "AMT RH System" manufactured by American Moisture Test, Inc., or equal.

2.3 CORRECTIVE (REMEDIAL) MVECS

- A. Description: Corrective MVER remediation system consisting of concrete mechanical surface profiling, sealer, and cementitious covering.
- B. Application: MVER remediation system are applied when test results indicate slab MVER, pH, or RH exceed selected coating or covering manufacturer's required, recommended, or accepted limits.
- C. Concrete Surface Profiling: ICRI concrete surface profile CSP 2 to CSP 3 (grind to light blast between 4 and 10 mils), unless otherwise explicitly required, recommended, accepted in writing by the sealer manufacturer.
- D. Sealer:
 1. Description: Moisture seal applied to substrates as a topical remediation.
 2. Products: "MES 100" manufactured by Floor Seal Technology, Inc., or equal.
 3. Requisite Properties:
 - a. Composition: Products may not contain latex, organic additives or chemistries that have a potential to either re-emulsify or support micro-organism growth.
 - b. Growth Resistance: Product must not support the growth of mold, mildew or biological growth.
 - c. Safety: Non-corrosive, non-toxic, and non-hazardous to installers.

- d. Water Pollution: Product must be a non-marine pollutant, and safe for natural water sources.
- e. Maximum VOC Material Content: Less than 100 grams per liter.
- 4. Performance Requirements:
 - a. Water Vapor Transmission: Products must bring emission rates of up to 20 pounds to within a range conforming to the flooring manufactures' requirements, when measured in conformance with ASTM F 1869.
 - b. Alkali Resistance: Tolerant to 14pH alkali exposure, when tested in conformance with ASTM D 1308 and ASTM F 710.
 - c. Minimum Adhesion Strength: Between 370 and 500 pounds per square inch, when tested in conformance with ASTM D 4541.
 - d. Adhesive Compatibility: Complete compatibility with all covering primers, adhesive, and materials.
 - e. Minimum RH Tolerance: Tolerant to at least 95 percent RH exposure, when determined in conformance with ASTM F 2170.
- E. Covering:
 - 1. Description: Cementitious topping applied directly over sealer to provide smooth substrate for finish flooring.
 - 2. Products: Hydraulic cement underlayment specified in Section 03 54 16.
 - 3. Minimum Thickness: Install underlayment to thickness required by either the sealer manufacturer or the finish flooring manufacturer (whichever is thicker), but not less than 1/8-inch.

2.4 ACCESSORIES

- A. Trowelable Patch and Fill Materials: Specified in Section 03 54 16 unless other products are supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- B. Other Accessories: Provide accessories and other similar secondary items supplied, required, recommended, or accepted by the MVECS manufacturer.

2.5 SURFACE PREPARATION

- A. Penetrants:
 - 1. Remove all dirt, dust, debris, and other foreign matter from concrete surfaces
- B. Marker Removal:
 - 1. Remove all slab markings by sanding or bead blasting surface clean.
 - 2. Completely remove all marker markings (i.e. Sharpie markers), marker paint, spray paint, and other markings.
- C. Floor Coatings and Fluid-Applied Flooring:

1. Provide one or more of the following ICRI concrete surface profiles, as applicable, unless otherwise explicitly required, recommended, or accepted in writing by the flooring manufacturer.
 - a. Sealers: CSP 1 to CSP 2. (grind to between 0 and 3 mils)
 - b. Thin-Film Coatings: CSP 2 to CSP 3. (grind to light blast between 4 and 10 mils)
 - c. High-Build Coatings and Resurfacing Applications: CSP 3 to CSP 5. (light to medium shotblast between 10 and 40 mils)
 - d. Self-Leveling Overlays: CSP 4 to CSP 6. (medium to heavy shotblast between 50 mils and 1/8-inch)
 - e. Polymer Overlays: CSP 5 to CSP 9. (medium shotblast to coarse planing between 1/8- and 1/4- inch)
 - f. Concrete Overlays, Toppings, and Repairs: CSP 5 to CSP 10. (medium shotblast to coarse planing greater than 1/4- inch)
 2. To reduce the risk of introducing microcracking into the substrate, all concrete surface profiling must be achieved through abrasive blasting, grinding, or shot blasting; or through the use of surface retarders.
 - a. Handheld concrete breakers, rotomilling, needle scaling, scabbling, and scarifying are prohibited, unless explicitly required or recommended in writing by the covering manufacturer (scarifying grooves/lines may become visible through a newly laid coverings).
 - b. Ultra-high- and high-pressure water jetting, and low-pressure water jetting surface preparation methods are also prohibited.
 - c. Chemical cleaning and acid etching are also prohibited. (residual chemicals not removed may adversely affect the flooring performance and adhesion – ASTM D 4262 covers procedures for determining the acidity or alkalinity of concrete surfaces prepared by chemical cleaning or etching prior to coating)
 3. Repair damaged sub-floor. Produce a uniform and smooth substrate. Fill cracks, holes, depressions, and similar substrate defects with trowelable leveling and patching compound; remove bumps and ridges.
 4. Sweep and vacuum-clean substrates just prior to beginning floor covering installation.
 5. Move floor coverings and installation materials into spaces at least 48 before installation.
- D. Floor Coverings: Prepare substrates in conformance with the requirements of ASTM F 710 and as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.
1. Verify substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives or that contain soap, wax, oil, or silicone; or that may negatively affect the quality of installation, durability, appearance, or performance of furnished flooring. Comply with the flooring manufacturers' instructions using manufacturer-recommended techniques and equipment. Do not use solvents.

3. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with leveling and patching compound. Apply, trowel, and float patching compound to achieve smooth, flat, hard surface. Prohibit traffic until patching compound is cured.
4. Repair damaged sub-floor. Produce a uniform and smooth substrate. Fill cracks, holes, depressions, and similar substrate defects with trowelable leveling and patching compound; remove bumps and ridges.
5. Sweep and vacuum-clean substrates just prior to beginning floor covering installation.
6. Do not install floor coverings until both they and the installation materials are acclimated to the same temperatures as the spaces into which they are installed. Move floor coverings and installation materials into spaces at least 48 before installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Before beginning testing, examine project conditions and field-verify measurements affecting the work of this specification section.
 1. Examine substrates scheduled for testing, and other conditions under which such items are tested, including HVAC operation and building enclosure.
 2. Verify that work performed as part of the work of other specification sections conforms to the testing equipment or testing kit manufacturer's requirements; and satisfies all other conditions relating to the quality of testing.

3.2 FIELD QUALITY CONTROL

- A. Site Tests and Inspections:
 1. General: Include site tests and inspections as part of the work of this specification section. The Owner's testing and inspection agency performs tests and inspections.
 - a. Schedule and arrange all tests and inspections.
 - b. Coordinate all work and the final construction schedule with all tests and inspections.
 - c. Coordinate tests and inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.
 - d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
 - e. Arrange tests and inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
 - f. Witness all site tests and inspections.
 - g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.

- h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.
2. Required Tests: Conduct the following tests on all concrete substrates prior to the installation of any flooring material or component regardless of substrate grade level or age.
 - a. MVER Testing (Anhydrous Calcium Chloride Test): Conduct CC tests in conformance with ASTM F 1869.
 - 1) Test area environmental conditions must match that of the finished floor covering.
 - 2) Doors, windows, and roofing must be installed and the building temperature controlled to a finished building atmosphere.
 - 3) Do not perform tests when the interior building temperature is below 65 deg. F for 72 hours prior to and throughout the duration of testing.
 - 4) The minim required number of test kits is determined by the square footage of areas scheduled to receive finish flooring. Provide at least 3 test kits for the first 1,000 square feet, and at least one additional test kit for each additional 1,000 square feet or fraction thereof, with consideration given to separation of test areas.
 - 5) Time of exposure must be between 60 hours 72 hours.
 - 6) Clean substrate in area to be tested by removing dust solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation, or laitance, mold mildew and other foreign materials.
 - 7) Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label and instruction document.
 - 8) Unseal dish and expose test according to preprinted test kit instructions.
 - 9) After exposure time has elapsed, retrieve test dish re-seal and re-weigh according to the manufacturer's instructions.
 - 10) Moisture emission rates exceeding 3 pounds may affect coating or covering. Verify permissible RH levels with individual flooring manufacturers.
 - b. Alkalinity (pH) Testing: Conduct pH test in conformance with ASTM F 710.
 - 1) Perform tests after abrasive removal of concrete surfaces.
 - 2) Place several drops of water on a clean portion of the substrate surface; form a puddle approximately one-inch in diameter. Allow the puddle to set for at least 60 seconds, and then insert the digital alkalinity-pH meter probe into the puddle. Allow the meter to calculate results for 15 seconds and record the meter readings.
 - 3) Concrete substrates must test between pH 8.0 and 10.0 before flooring materials are installed; slabs may not exceed pH 10.0.
 - 4) Readings exceeding pH 10.0 may affect coating or covering. Verify permissible pH levels with individual flooring manufacturers.
 - c. RH Probe Test: Conduct *in situ* RH probe testing in conformance with ASTM F 2170

- 1) Concrete floor slabs must be at the in-service temperature and the occupied air space above the slab must be at the in-service temperature and RH for at least 48 hours before taking RH measurements in the substrate.
- 2) Perform at least 3 tests for the first 1,000 square feet and at least one test for every additional 1,000 square feet or fraction thereof.
- 3) At below-grade substrates, choose testing locations within 3 feet of each exterior wall.
- 4) Drill probe holes 40 percent down into the slab for slabs drying from the top only; 20 percent into the slab for slabs drying from top and bottom.
- 5) Use a vacuum cleaner to remove dust from drilled holes, and allow at least 72 hours for holes to achieve moisture equilibrium within each hole before taking RH measurements.
- 6) After the 72-hour equilibrium period, insert probes and allow a 30-minute period for each probe to reach temperature equilibrium before measuring RH.
- 7) Use the RH probe to measure the ambient air temperature and RH above the slab in the vicinity of the hole.
- 8) RH readings exceeding 75 percent may affect coating or covering. Verify permissible RH levels with individual flooring manufacturers.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

END OF SECTION

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SECTION 09 22 16 – LIGHTGAGE METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal furring for supporting interior finish materials.
2. Metal framing for supporting interior partition and ceiling assemblies.
3. Delegated design of metal framing assemblies.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 05 40 00 for cold-formed metal framing, including manufactured (pre-engineered) headers and metal wall backings.
2. Section 09 22 26 for metal suspension systems.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. BMT: Base Metal Thickness.msg
2. MSG: Manufacturer's Standard Gage for Sheet Steel.
3. HDG: Hot Dip Galvanized.

B. Definitions:

1. Manufacturer: Means the metal framing manufacturer, unless otherwise indicated.
2. Metal Framing: Means lightgage metal framing.
3. Gage: Means the thickness of sheet metal based on weight measured in pounds per square foot per inch of thickness. For the purposes of this specification, gages are classified the Table below. Minimum thickness indicated in the first column is equivalent to 95 percent of the design thickness and is the minimum acceptable thickness of base metal delivered to the project site.
4. Manufacturers' Standard Gage for Sheet Metal: Means the steel sheet thickness based on a weight of 41.82 pounds per square foot per inch of thickness.
5. Base Metal Thickness: Means the thickness of sheet steel material without any coatings.
6. Lightgage Metal Framing: Means metal framing members having a BMT of 30 mils BMT (MSG 20) or less and installed in non-load bearing interior construction assemblies typically supporting plaster or gypsum board.

7. Cold-Formed Metal Framing: Means metal framing members having a BMT range of between 118 mils BMT (MSG 10) and 33 mils BMT (MSG 20) and installed in transverse or axial load-bearing applications, or in non-load bearing interior construction assemblies typically supporting plaster or gypsum board.

Reference Gage	Minimum Thickness (mils)	Design Thickness (inch)
Lightgage Metal Framing specified in this specification Section		
25	18	0.0188
22	27	0.0283
20	30	0.0312
Cold-Formed Metal Framing specified in Section 05 40 00		
20	33	0.0346
18	43	0.0451
16	54	0.0566
14	68	0.0713
12	97	0.1017
10	118	0.1242

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

- Where engineering is required, including when manufacturer's loading tables are exceeded, engineer, fabricate, assemble, and install framing that conforms to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound, and non-corroding assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
- Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

- Interior Partition Uniformly Distributed Lateral Live Load: At least 7.5 pounds per square foot.
- Design Loads: Interior partitions must also accommodate, resist, distribute, or transfer, as applicable, other loads to which they are subjected, including attachment of any architectural components, non-structural components, equipment, and similar items.

3. Superstructure Displacement:
 - a. Vertical Displacement of Adjacent Stories (Live Load Deflection): Allow for at least 3/4-inch vertical live load structure deflection, unless otherwise indicated on the structural drawings and general notes.
 - b. Horizontal Displacement of Adjacent Stories (Interstory Drift): Accommodate design displacement of adjacent stories indicated on the structural drawings and general notes.
 4. Seismic Loads: Resist, distribute, or transfer seismic loads indicated on the structural drawings without incipient or catastrophic failure.
 5. Perpendicular Deflection (Convexity and Concavity): Framing members may not deflect more than shown in the International Building Code or the following, whichever is less, measured normal to the assembly plane. Limit asymmetric wall construction deflection to the most stringent requirement that applies to the assembly.
 - a. Construction Supporting Masonry: Not more than L/360.
 - b. Construction Supporting Stone: Not more than L/960.
 - c. Construction Supporting Plaster: Not more than L/360.
 - d. Construction Supporting Gypsum Board: Not more than L/240.
 - e. Construction Supporting Tile: Not more than L/360.
- C. Acoustic Requirements: Where materials are part of an STC-rated assembly, provide items within the assembly that are identical to or better than those products indicated as listed and tested in conformance with ASTM E 90 and ATM E 413.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing framing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished framing.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.

- b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
 - a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
 - b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
 - c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
 3. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Framing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Quality Standards:

1. Comply with all requirements of the International Building Code (IBC).
2. Comply with ASTM C 754 requirements for installation of lightgauge metal framing, except conform to the framing sizes and spacing indicated.
3. Comply with the requirements of ASTM C 840 that apply to framing installation

C. Qualifications:

1. Installer: Company or individuals must have at least 5 years' experience installing framing for at least 30 previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have at least 7 years' experience installing framing for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading framing installers.

3. Engineer: Must be a licensed professional structural engineer registered to practice in Hawaii having at least 10 years' experience performing the kind of engineering services indicated for at least 20 previous projects similar to this project in size, material, design, and complexity.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
 1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective framing with undamaged new framing that does not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 1. California Expanded Metal Products Co. (CEMCO)
 2. Clarkwestern Dietrich Building Systems LLC.
 3. Olmar Supply Inc.

4. SCAFCO Corp.

2.2 MATERIALS

- A. Cold-Formed Metal Framing: ASTM A 1003, ST50 (Structural Grade 50), with at least a G60 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.
- B. Lightgauge Metal Framing: ASTM C 645 manufactured from HDG metallic-coated steel sheet conforming to ASTM A 1003, NS33 (Non-Structural Grade 33), with at least a G40 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.

2.3 COLD-FORMED METAL FURRING

- A. Hat Furring Channels:
 - 1. Products: "FC Series Furring Channel" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
 - 2. Requisite Properties:
 - a. Depth: 7/8- or 1-1/2-inch deep channels, as indicated.
 - b. Minimum Thickness: At least 43 mils BMT (MSG 18).
 - c. Web: 1-1/4 inches wide.
 - d. Screw Flanges: 3/4-inch wide.
- B. Z-shaped Furring Channels:
 - 1. Products: "Z-Furring (ZF-Series)" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
 - 2. Requisite Properties:
 - a. Depth: One to 3 inches deep, as indicated.
 - b. Minimum Thickness: At least 43 mils BMT (MSG 18).
 - c. Screw Flanges: 1-1/4 inches wide.

2.4 LIGHTGAGE METAL FURRING

- A. Hat Furring Channels:
 - 1. Products: "Hat" or "F" furring channel manufactured by CEMCO, or equal.
 - 2. Requisite Properties:
 - a. Depth: 7/8- or 1-1/2-inch deep, as indicated.
 - b. Minimum Thickness: At least 30 mils BMT (MSG 20).
 - c. Web: 1-1/4 inches wide or 2-1/2 inches.
 - d. Screw Flanges: 1/2-inch wide.
- B. Z-shaped Furring Channels:
 - 1. Products: "CEMCO Z - Furring Channel" manufactured by CEMCO, or equal.

2. Requisite Properties:
 - a. Depth: 7/8-inch.
 - b. Minimum Thickness: At least 30 mils BMT (MSG 20).
 - c. Screw Flanges: 1-1/4 inches wide.
- C. Standard Resilient Channels:
 1. Products: "RC1-X" manufactured by CEMCO, or equal.
 2. Requisite Properties:
 - a. Depth: 1/2-inch deep.
 - b. Minimum Thickness: At least 30 mils BMT (MSG 20).
 - c. Screw Flanges: 1-1/4 inches wide.
- D. Resilient Channels for Acoustical Applications:
 1. Product: "RC Deluxe Resilient Channel (RCSD)" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
 2. Requisite Properties:
 - a. Depth: 1/2-inch deep.
 - b. Minimum Thickness: At least 27 mils BMT (MSG 22).
 - c. Screw Flanges: 1-1/2 inches wide.
- E. Resilient Sound Isolation Clips:
 1. Description: Molded rubber and steel resilient sound isolation wall and ceiling clips.
 2. Products: Provide one of the following, or equal.
 - a. "IsoMax" manufactured by Kinetics Noise Control, Inc.
 - b. "RSIC-1" manufactured by PAC International, Inc.
 - c. "GenieClip Resilient Sound Isolation Clip" manufactured by Pliteq, Inc.

2.5 LIGHTGAGE STUD FRAMING

- A. Studs:
 1. Description: Pre-punched C-shaped framing members with manufacturer's standard knockout sizing and spacing.
 2. Product: "Viper Stud" manufactured by CEMCO, or equal.
 3. Requisite Properties:
 - a. Depth: Indicated on the Drawings.
 - b. Minimum Thickness: At least 30 mils BMT (MSG 20).
 - c. Flanges: 1-1/4-inch wide stiffened flanges with at least 1/4-inch returns (lip).
- B. Tracks (Top and Bottom Runners):
 1. Description: Un-punched U-shaped runners manufactured from the same material to corresponding stud sizes and gages.
 2. Product: "Viper Track" manufactured by CEMCO, or equal.
 3. Requisite Properties:

- a. Depth: Indicated on the Drawings.
 - b. Minimum Thickness: At least 30 mils BMT (MSG 20).
 - c. Flanges: At least 1-1/4-inch wide unstiffened flanges.
- C. High-Performance Studs:
1. Description: Pre-punched C-shaped framing members with manufacturer's standard knockout sizing and spacing.
 2. Product: "Viper-X Stud" manufactured by CEMCO, or equal.
 3. Requisite Properties:
 - a. Depth: Indicated on the Drawings.
 - b. Minimum Thickness: At least 28 mils BMT.
 - c. Flanges: 1-7/16-inch wide flanges with at least 3/8-inch returns (lip).
- D. High-Performance Tracks (Top and Bottom Runners):
1. Description: Un-punched U-shaped runners manufactured from the same material to corresponding stud sizes and gages.
 2. Product: "Viper-X Track" manufactured by CEMCO, or equal.
 3. Requisite Properties:
 - a. Depth: Indicated on the Drawings.
 - b. Minimum Thickness: At least 28 mils BMT.
 - c. Flanges: At least 1-1/4-inch wide unstiffened flanges.
- E. Deflection Tracks:
1. Description: Slotted roll- or brake-formed track installed in head-of-wall deflection conditions to accommodate vertical movement caused by normal head-of-wall and floor extension or compression.
 2. Products: "CEMCO Slotted Track (CST)" or "SLP-TRK" manufactured by CEMCO, or equal.
- F. Cold Rolled Channel (CRC) Bridging:
1. Description: Un-punched U-shape stiffeners installed in both load-bearing and non-load bearing walls to help resist stud twisting.
 2. Requisite Properties:
 - a. Size: 1-1/2-inch wide by 1/2-inch deep.
 - b. Minimum Thickness: At least 54 mils BMT (MSG 16).
 - c. Flanges: 1/2-inch wide unstiffened flanges.
 3. Manufactured Bridging Clips: "SUBH Wall Stud Bridging Connectors" manufactured by CEMCO, or equal.
- G. Flat Strap Bridging (Strapping):
1. Application: Flat sheet installed to provide resistance to stud rotation and minor axis buckling under loads for studs deeper than 6 inches.
 2. Requisite Properties:
 - a. Width: Between 2 and 20 inches, as indicated or necessary.

- b. Minimum Thickness: At least 54 mils BMT (MSG 16).

2.6 SPECIALTY FRAMING

A. Corner Angles:

1. Description: Utility angles installed as a connection strut or angle, as corner reinforcement, or other various framing applications.
2. Requisite Properties:
 - a. Minimum Thickness: At least 30 mils BMT (MSG 20).
 - b. Legs: 2- or 3-inch wide legs, as indicated, unless a wider or uneven leg size is explicitly indicated; or is otherwise supplied, required, recommended, authorized, or accepted by the manufacturer.

2.7 ACCESSORIES

A. Partition Closures:

1. Description: Narrow resilient partition termination and sound deterrent manufactured from extruded Silicone conforming to ASTM D 2000, 4GE 709 M.
2. Application: Used at voids between partition ends and exterior curtain walls; must allow exterior glass deflection during positive and negative wind loading.
3. Product: "Rizza PCS" manufactured by Balco, Inc., or equal.
4. Color: Indicated on the Drawings or selected by the Architect.

B. Fire-Rated Partition Closures:

1. Description: Narrow partition termination and sound deterrent manufactured from dual-sided silicone sealing surfaces adhered to fire-retardant impregnated foam backing.
2. Application: Used at voids requiring a fire-resistance rating between partition ends and exterior curtain walls; must allow exterior glass deflection during positive and negative wind loading.
3. Product: "WFR2" manufactured by EMSEAL, or equal.
4. Color: Indicated on the Drawings or selected by the Architect.

C. Mullion Closures:

1. Description: Factory-assembled, spring loaded, pre-finished aluminum adjustable partition closure.
2. Application: Used at voids between partition ends and exterior storefront or curtain wall mullions.
3. Product: "Mullion Mate" manufactured by Gordon, Inc., or equal.
4. Color: Match curtain wall mullions.

D. Decoupling Sound Isolation Clips: "RSIC-DC04" manufactured by PAC International, LLC, or equal.

- E. Resilient Channel Vibration Isolation Clip: “Cylent Assurance Clip” manufactured by Keene Building Products, Inc., or equal.
- F. Resilient Partition Isolation Pad:
 - 1. Description: Molded fiber glass board.
 - 2. Application: Used to decouples sound-rated partitions from non-isolated structure.
 - 3. Product: “Wallmat” stud wall isolation strip manufactured by Kinetics Noise Control, Inc., or equal.
 - 4. Accories: “KAI” isolation bushing assemblies manufactured by Kinetics Noise Control, Inc., or equal.
- G. Low Partition Wall Floor Anchors: “Floor Anchor” stud reinforcement manufactured by Pinquist Tool & Die Co., Inc., or equal.
- H. Steel Beam and Column Wallboard Clips: “The Claw” beam clips manufactured by Claw International, or equal.
- I. Shims: Load bearing, non-leaching, high-density multimonomer plastic.
- J. Screw Fasteners: Provide #8-32 UNC 2B (0.164-inch shank diameter, 32 threads per inch) by at least one-inch long, pan head, coarse thread, self-piercing or self-drilling as applicable, chromate finish zinc-plated steel screw fasteners, unless another fastener type is explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- K. Power-Actuated Fasteners:
 - 1. Description: ICC-ES-approved anchors conforming to the International Building Code, unless a more stringent Occupancy Category or Seismic Design Category is indicated on the Structural Drawings.
 - 2. Manufacturer: Provide products manufactured by Hilti, Inc., or equal.
- L. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- M. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install framing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Installed framing must be warrantable. Do not install, correct, or replace framing in a manner that results in any warranty or guarantee becoming void.
- B. Metal Furring Special Techniques:
 - 1. Direct Furring: Attach to concrete or to masonry with stub nails, screws designed for masonry attachment, or power-actuated fasteners spaced 24 inches on center.
 - 2. Z-Furring:
 - a. Except at outside corners, securely attach narrow flanges of furring members to walls with concrete stub nails, screws designed for masonry attachment, or power-actuated fasteners spaced 24 inches on center.
 - b. At outside corners, attach wide flange of furring members to walls with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- C. Metal Framing Special Techniques:
 - 1. Align and securely attach floor and ceiling tracks to superstructure.
 - 2. Install studs in single lengths extending from floor to underside of floor or roof structure above without joints, except where indicated on the Drawings as stopping at or above ceilings. Stud splicing is prohibited without prior written authorization from the Architect.
 - a. Install studs so that flanges within framing systems point in same direction.
 - b. Continue framing around ducts that penetrate partitions above ceilings.
 - c. Where framing extends to overhead structural supports, install vertical deflection connectors to produce joints at tops of framing assemblies that prevent axial loading of finished assemblies.

- d. Where studs stop at or above ceilings, brace not more than every fourth stud with opposite-side bracing installed at 45-degree angles and securely fastened to the underside of the floor or roof structure above.
 - e. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
 - f. Assemble corners using at least 3 studs.
3. Unless otherwise indicated, provide screw attachment to tracks for
 - a. studs with gypsum board on only one side;
 - b. studs on each side of doors and windows;
 - c. studs supporting wall hung plumbing fixtures; and
 - d. studs supporting wall hung urinal screens, toilet compartments, cabinets, equipment, and similar items.
 4. Attach all other studs to tracks either by friction fit for single stud gypsum board partitions or by attaching with screws in conformance with the manufacturer's published installation instructions.
 - a. Space anchors within 6 inches of ends of each track segment ends, and not more than 24 inches on center.
 - b. Do not install fasteners within 3 inches of slab or curb edges.
 5. Where required by engineering calculations, install horizontal bridging spaced not more than 54 inches on center. Unless otherwise indicated, provide bridging in partitions supporting wall supported cabinets.
 - a. Provide an additional 3/4 inch channel 6 inches above door headers, and extend at least 3 studs beyond the jamb studs.
 - b. Install channels in longest possible lengths. At end joints, lap at least 12 inches and wire-tie. Do not tie together channels on opposite sides of staggered or double stud partitions.
- D. Door and Window Opening Special Techniques:
1. Provide double studs (installed face to face to form a tube) at locations adjacent to doors and openings.
 2. Extend studs at door openings to slab or deck above and securely anchor both to bottom track and to top slab or deck.
 3. Locate additional studs not more than 2 inches from door and window frames, abutting partitions, partition corners, and other construction.
 4. Install sections of track over door and window frames with clip angles securely attached at each end to adjacent vertical studs. Install cut-to-length studs at vertical joint locations; and at standard spacing over the door frame header extending to the ceiling track.
 5. Install cripple studs at opening heads adjacent to each jamb stud, with at least a 1/2 inch clearance from the jamb stud to allow for installation of control joint in the finished assembly.
- E. Other Opening Special Techniques: Unless otherwise indicated, frame other openings and recesses in stud walls the same as that required for door openings.
1. Install framing below sills matching framing required above door heads.

2. Provide additional framing as required for the secure attachment of electrical boxes, fire extinguisher cabinets, and similar items located in stud walls.
- F. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach framing to supporting construction.
- G. Installation Tolerances: Install framing within the following tolerance variations.
1. Maximum Out of Plumb: Not more than $L/960$ of span, or 1/8-inch in 10 feet.
 2. Maximum Out of Level: Not more than $L/960$ of span, or 1/8-inch in 10 feet,
 3. Maximum Out of Plane: Fastening surfaces of adjacent framing members may not vary by more than 1/8-inch.
 4. Maximum Stud Spacing Variance: Not more than 1/8-inch. Cumulative error may not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 09 22 26 – METAL SUSPENSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal furring and framing systems for supporting suspended gypsum board ceilings.
2. Delegated design of metal furring and framing assemblies.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. BMT: Base Metal Thickness.msg
2. MSG: Manufacturer's Standard Gage for Sheet Steel.
3. HDG: Hot Dip Galvanized.

B. Definitions:

1. Manufacturer: Means the metal suspension system manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

1. Where engineering is required, including when manufacturer's loading tables are exceeded, engineer, fabricate, assemble, and install suspension systems that conform to the profiles indicated and other Contract Document requirements; meet specified performance criteria; and result in structurally sound, and non-corroding assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

1. Superstructure Deflection and Story Drift: Accommodate design displacement of adjacent stories indicated on the structural drawings.
2. Seismic Loads: Resist, distribute, or transfer seismic loads indicated on the structural drawings without incipient or catastrophic failure.

3. Perpendicular Deflection (Convexity and Concavity): Drywall support system may not deflect more than $L/240$, measured normal to the assembly plane.

- C. Acoustic Requirements: Where materials are part of an STC-rated assembly, provide items within the assembly that are identical to or better than those products indicated as listed and tested in conformance with ASTM E 90 and ATM E 413.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
 - a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
 - b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
 - c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 1. Suspension system components must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.

- b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Quality Standards:
 1. Comply with all requirements of the International Building Code (IBC).
- C. Qualifications:
 1. Installer: Company or individuals must have at least 5 years' experience installing suspension systems for at least 30 previous projects similar to this project in size, material, design, and complexity.
 2. Supervisors: Individuals must have at least 7 years' experience installing suspension systems for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading suspension system installers.
 3. Engineer: Must be a licensed professional structural engineer registered to practice in Hawaii having at least 10 years' experience performing the kind of engineering services indicated for at least 20 previous projects similar to this project in size, material, design, and complexity.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
 1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
 2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 3. Incline covered items to ensure maximum drainage of accumulated moisture.
 4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective suspension system components with undamaged new suspension system components that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. California Expanded Metal Products Co. (CEMCO)
 - 2. ClarkDietrich Building Systems.
 - 3. Olmar Supply Inc.
 - 4. SCAFCO Corp.

2.2 MATERIALS

- A. Cold-Formed Metal Framing: ASTM A 1003, ST50 (Structural Grade 50), with at least a G60 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.
- B. Lightgage Metal Framing: ASTM C 645 manufactured from HDG metallic-coated steel sheet conforming to ASTM A 1003, NS33 (Non-Structural Grade 33), with at least a G40 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.

2.3 COMPONENTS

- A. Galvanized Carbon Steel Wire:
 - 1. Hanger Wire: At least 0.162-inch diameter (SWG 8).
 - 2. Diagonal Bracing Wire: At least 0.106-inch diameter (SWG 12).
 - 3. Tie Wire: At least 0.050-inch diameter (SWG 18).
- B. Standard Furring Clips:
 - 1. Application: Used in lieu of tie wire to attach metal furring channels to 1-1/2-inch U-channels in drop ceiling assemblies.
 - 2. Restrictions:
 - a. Clips must be installed on alternating sides of carrying channels. Use tie wire when clips cannot be alternated.
 - b. Clips must only be used when single-layer gypsum or single-layer veneer plaster base is used. Otherwise use tie wire.

3. Product: "Metal Furring Channel Clips (MFCC)" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
- C. Resilient Sound Isolation Furring Clips:
1. Application: Used in lieu of tie wire to attach metal furring channels to 1-1/2-inch U-channels in drop ceiling assemblies.
 2. Restrictions:
 - a. Clips must be installed on alternating sides of the 1-1/2-inch channels. Use tie wire when clips cannot be alternated.
 - b. Clips must only be used when single-layer gypsum or single-layer veneer plaster base is used. Otherwise use tie wire.
 - c. Carrying channels (U-channels) may not exceed 48-inch on center spacing.
 - d. Furring channels (hat channel) may not exceed 24-inch on center spacing.
 3. Product: "GenieClip C3" manufactured by Pliteq Inc., or equal.
- D. Flat Hangers (Straps):
1. Width: At least 2 inches.
 2. Minimum Thickness: At least 97 mils BMT (MSG 12).
- E. U-Channel or Cold Rolled Channel (CRC) Carrying Channels:
1. Deep: 3/4- or 1-1/2-inches.
 2. Minimum Thickness: At least 97 mils BMT (MSG 12).
 3. Flanges: 1/2 inch wide.
- F. Hat Furring Channels:
1. Products: "Hat" or "F" furring channel manufactured by CEMCO, or equal.
 2. Depth: 7/8- or 1-1/2-inch deep, as indicated.
 3. Minimum Thickness: At least 30 mils BMT (MSG 20).
 4. Web: 1-1/4 inches wide or 2-1/2 inches.
 5. Screw Flanges: 1/2-inch wide.

2.4 ACCESSORIES

- A. Attachment Devices: Sized for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.
- B. Seismic Separation Joints: Provide seismic separation joints at ceiling locations where the contiguous area of non-broken ceiling is 2,500 square feet or greater.
- C. Compression Struts:
1. Cold or hot rolled angles, loadbearing or non-loadbearing studs, EMT or rigid conduit, or black iron.
 2. Cold-rolled steel section with maximum L/R ratio of 200.

- D. Screw Fasteners: Provide #8-32 UNC 2B (0.164-inch shank diameter, 32 threads per inch) by at least one-inch long, pan head, coarse thread, self-piercing or self-drilling as applicable, chromate finish zinc-plated steel screw fasteners, unless another fastener type is explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- E. Power-Actuated Fasteners:
 - 1. Description: ICC-ES-approved anchors conforming to International Building Code Occupancy Category III, Seismic Design Category E, unless a more stringent Occupancy Category or Seismic Design Category is indicated on the Structural Drawings.
 - A. Manufacturer: Provide products manufactured by Hilti, Inc., or equal.
- F. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- G. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:

1. Install suspension systems using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 2. Installed suspension systems must be warrantable. Do not install, correct, or replace suspension systems in a manner that results in any warranty or guarantee becoming void.
- B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach suspension systems to supporting construction.
- C. Installation Tolerances: Install suspension systems within the following tolerance variations.
1. Maximum Out of Plane: Surfaces may not vary by more than 1/8-inch in 10 feet.
 2. Carrying Channel Maximum Out of Level: Not more than 1/8-inch in 12 feet,
 3. Main Runner Maximum Out of Level: Not more than 1/4-inch in 10 feet,
 4. Main Runner Maximum Deflection: Not more than L/360 of span,
 5. Maximum Misalignment of Main Runners: 0.015-inch.
 6. Maximum Misalignment of Intersection Members: 0.020-inch.
 7. Main Runner Bow, Camber, and Twist: Not more than 1/32-inch in 2 feet bow or camber; not more than one degree twist.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

OUTPATIENT ONCOLOGY CLINIC
KONA COMMUNITY HOSPITAL
BIDDING DOCUMENTS

KYA INC.
PROJECT NO. 23043.00
04/05/2024

END OF SECTION

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SECTION 09 28 15 – GMF GYPSUM TILE BACKING BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. GMF gypsum backing board.
2. Installation materials.
3. Joint treatment materials.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 29 00 for requirements for marking and identification of wall and partition construction required to have protected openings or penetrations.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. GMF: Glass Mat Faced.

B. Definitions:

1. Manufacturer: Means the backing board manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished backing boards.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Backing boards must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Backing board must be manufactured in North America by a domestic company from gypsum mined in North America; synthetic gypsum recovered from coal-fired plants operating in North America (FGD gypsum); or a combination of both.
 - a. Backing board manufactured outside of North America by a domestic company are prohibited.
 - b. Backing board manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company are prohibited.
3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.5 HANDLING

- A. General: Comply with GA publication GA 801 "*Handling Gypsum Board*" and applicable requirements of ASTM C 1264 for the inspection, rejection, certification, packaging, marking, shipping, handling, and storage of gypsum panel products.
- B. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- C. Storage: Store unloaded items as shipped, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.
 1. Store items indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas; where "wet work" within storage areas (e.g.,

- concrete, cast underlayment, mortaring, grouting, plastering, gypsum board finishing, etc.) is complete and cured or dried to a condition of equilibrium.
2. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
- D. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
- E. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.
- F. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide products manufactured by one of the following, or equal.
1. CertainTeed Corp.
 2. GP Building Products.
 3. National Gypsum Co.
 4. USG Corp.

2.2 GMF GYPSUM BACKING BOARD

- A. Description: Gypsum-based GMF water-resistant gypsum backing panel conforming to ASTM C 1178 installed as a base for the application of ceramic tile.
- B. Applications: Installed as a base for the application of ceramic tile and behind fiberglass bathtub surround walls.
- C. Restrictions: May not be used
1. as a base for nailing or mechanical fastening;
 2. as a radiant barrier behind fireplaces;
 3. in exterior applications; and
 4. In direct contact with concrete or concrete masonry units.
- D. Products: Provide one of the following, or equal.
1. "DensShield Tile Backer" manufactured by GP Building Products.
 2. "GlasRoc Tile Backer" manufactured by CertainTeed Corp.
 3. "Gold Bond eXP Tile Backer" manufactured by National Gypsum Co.

E. Requisite Properties:

1. Minimum Size: At least 4-foot by 8-foot sheets.
2. Minimum Thickness: 1/2-inch regular core panels and 5/8-inch Type X panels.
3. Minimum Mass: At least 2.2 pounds per square foot.
4. Edges: Tapered long edges and square ends.
5. Facers: Heat-cured, acrylic-coated, fiberglass mat wrapped around panel face, back side, and long edges. Water repellent paper facers and backings are prohibited.

F. Performance Requirements:

1. Resistance to the Propagation of Mold and Mildew: Minimum score of 10 (no visual defacement), when tested in conformance with ASTM D 3273.

2.3 INSTALLATION MATERIALS

- A. Fasteners: Provide 0.164-inch shank diameter (#8-32 UNC) by at least 1-1/4-inch-long Philips drive socket, bugle or wafer head, self-drilling stainless steel, bi-metal, duplex anti-corrosive steel, 3-coat anti-corrosive steel, or ceramic-coated anti-corrosive steel screw fasteners, unless another fastener type is explicitly indicated; or is otherwise supplied, required, recommended, or accepted by the manufacturer.

2.4 JOINT TREATMENT MATERIALS

A. Glass Mesh Tape:

1. Description: 2-inch wide, alkali-resistant, polymer-coated, 10x10 glass-fiber mesh tape.
2. Application: Used in combination with joint sealant as a panel joint and penetration treatment for long-term joint protection.
3. Product: Supplied, required, recommended, or accepted by the manufacturer.

B. Polymer-Modified Cementitious Mortar:

1. Description: Premium-grade (best quality grade), single-component, ultra-high-performance, polymer-modified Portland cement mortar conforming to A118.15 shear bond strength requirements.
2. Application: Used for embedding joint tape and finishing backing board in wet locations (e.g., toilet rooms, shower rooms, saunas, steam rooms, kitchens, swimming pool enclosures, etc.). Do not use drying-type joint compound, setting-type joint compound, or paper tape in wet locations.
3. Products: Provide one of the following, or equal.
 - a. "MegaFlex Crack Prevention Mortar" manufactured by Custom Building Products.
 - b. "254 Platinum" manufactured by LATICRETE International, Inc.
 - c. "Ultraflex 3" manufactured by Mapei Corp.

C. Setting-Type Joint Compound:

1. Description: Lightweight, sandable, chemically setting powder compound conforming to ASTM C 475 and
2. Application: Used for embedding joint tape and finishing backing board in locations other than wet locations. All-purpose and drying type joint compounds are prohibited.
3. Product: "ToughRock Sandable Setting Compound" manufactured by GP Building Products, or equal.

2.5 ACCESSORIES

- A. Sealant: Provide fluid-applied low modulus joint sealant specified in Section 07 92 10, unless another type of sealant; or supplied, required, recommended, or accepted by the manufacturer to seal sheathing joints and fastener penetrations.
- B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 1. Install backing boards using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 3. Installed backing boards must be warrantable. Do not install, correct, or replace backing boards in a manner that results in any warranty or guarantee becoming void.
- B. Interface with Adjacent Items:
1. Provide materials, components, and accessories normally furnished or necessary to securely attach backing boards to supporting construction.
 2. Do not install vapor retarders directly behind backing board.
- C. Installation Tolerances: Install backing boards to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 09 29 00 – GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum board panels.
2. Metal trim.
3. Installation materials.
4. Joint treatment materials.
5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 28 15 for GMF gypsum tile backing board.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. GMF: Glass Mat Faced.

B. Definitions:

1. Manufacturer: Means the gypsum board manufacturer, unless otherwise indicated.
2. Enclosure: Means a level of protective resistance to weather provided for interior spaces during the construction phase by either permanent construction or substantial temporary construction. Other terms, including “enclosed” and similar terms, have the same meaning as “enclosure”.
 - a. Uncontrolled Enclosure: Means short-term, limited, temporary protection against wind for up to 6 months before completion of the permanent enclosure, as determined by the Architect, whose decision is final.
 - b. Partially-Controlled Enclosure: Means medium-term, limited, temporary protection against both wind and rain for up to 12 months before completion of the permanent enclosure, as determined by the Architect, whose decision is final.
 - c. Permanent Enclosure: Means complete permanent protection against wind, temperature, humidity, atmospheric pressure, and precipitation; provided by a permanent insulated and weathertight roofing system, permanent insulated and weathertight exterior wall construction, and openings closed with permanent protectives or substantial temporary closures equivalent in protection to permanent protectives, as determined by the Architect, whose decision is final.

3. Dry-In: Means that the building shell is sufficiently complete to keep out wind, rain, and other weather. Other terms, including “box-in” and similar terms, have the same meaning as “dry-in”. At a minimum, dry-in includes
 - a. all exterior walls are constructed with weather-resistive barrier or air barrier applied;
 - b. roof deck is installed with an appropriate waterproof covering; and
 - c. windows and doors are installed.
4. Locations:
 - a. Wet Locations: Means interior locations subject to moisture during normal activities for which the space was designed (e.g., toilet rooms, shower rooms, saunas, steam rooms, kitchens, swimming pool enclosures, etc.)
 - b. Dry Locations: Means normally dry interiors.
5. Pre-Rock Construction: Means the limited installation of gypsum board panels in locations exposed to ambient moisture during the normal construction cycle before the structure is either partially controlled or permanently enclosed. Pre-rock construction is not limited to top-down construction. Other terms, including “pre-dry-in” and similar terms, have the same meaning as “pre-rock”.
6. Top-Down Construction: Means the limited installation of gypsum board panels only in plenums above the finished ceiling plane after the installation of metal framing is complete and before the installation of ducts, conduits, pipes, or other items that penetrate the gypsum board assemblies begins.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate locations of control joints to ensure the recommended spacings of control joints for gypsum wall and ceiling panels are accommodated.
 - a. If control joints are not indicated on the construction drawings, do not anticipate the quantity is zero.
 - b. Propose locations on shop drawings or submit an RFI to the Architect before submitting bid proposal.
2. Final locations of control joints are subject to Architect’s approval.

B. Preinstallation Meeting:

1. Hold the meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation.
3. Discuss and finalize locations and extents of all control joints.
4. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed underlayment. Resolve each condition.
5. Finalize construction schedule.

6. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.
- C. Sequencing: Deliver paper-faced gypsum board to the project site only after building dry-in.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings:
 - a. Submit dimensioned plans and elevations drawn to scale and showing locations, sizes, and extents of all control joints. Label manufactured items by product name.
 - b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
- B. Informational Submittals: Submit the following for information (informal review; responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished gypsum board.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 1. Gypsum board must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.

- b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Gypsum board must be manufactured in North America by a domestic company from gypsum mined in North America; synthetic gypsum recovered from coal-fired plants operating in North America (FGD gypsum); or a combination of both.
 - a. Gypsum board manufactured outside of North America by a domestic company are prohibited.
 - b. Gypsum board manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company are prohibited.
 3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Qualifications:
 1. Installer: Company or individuals must have at least 5 years' experience installing gypsum board for at least 30 previous projects similar to this project in size, material, design, and complexity.
 2. Supervisors: Individuals must have at least 7 years' experience installing gypsum board for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading gypsum board installers.

1.6 HANDLING

- A. General: Comply with GA publication GA 801, "*Handling Gypsum Board*" and applicable requirements of ASTM C 1264 for the inspection, rejection, certification, packaging, marking, shipping, handling, and storage of gypsum panel products.
- B. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 3. Unload and store only inspected and accepted items.
- C. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
 1. Furnish adequate dunnage and bracing during storage.
 2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
 3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

- D. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.
- E. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective gypsum board with undamaged new gypsum board that does not exhibit deterioration, damage, or defects.
- F. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide products manufactured by one of the following, or equal.
 - 1. CertainTeed Corp.
 - 2. GP Building Products.
 - 3. National Gypsum Co.
 - 4. USG Corp.

2.2 PRE-ROCK GYPSUM BOARD

- A. Description: GMF interior gypsum panels conforming to ASTM C 1658.
- B. Application: Pre-rock panels must be used when gypsum board is installed prior to dry-in.
- C. Products: Provide one of the following, or equal.
 - 1. "DensArmor Plus Interior Panels" manufactured by GP Building Products.
 - 2. "e²XP Interior Extreme" manufactured by National Gypsum Co.
 - 3. "SHEETROCK Glass-Mat Panels Mold Tough" manufactured by USG Corp.
- D. Requisite Properties:
 - 1. Minimum Size: Provide at least 4-foot by 8-foot sheets.
 - 2. Minimum Thickness: 1/2-inch regular core panels and 5/8-inch Type X panels.
 - 3. Edges: Tapered long edges and square ends.
 - 4. Facers: Heat-cured, acrylic-coated, fiberglass mat on the face side, back side, and around long edges. Water repellent paper facers and backings are prohibited.

2.3 FIRE-RESISTANCE RATED GYPSUM BOARD

- A. Fire-Resistance-Rated Gypsum Wall and Ceiling Board:
 - 1. Description: Gypsum board conforming to ASTM C 1396.

2. Applications: Installed in fire-resistance-rated and non-rated interior partition assemblies constructed in dry locations.
 3. Products: Provide one of the following, or equal.
 - a. "ProRoc Type X" and "ProRoc Type C" manufactured by CertainTeed Corp.
 - b. "ToughRock Fireguard" and "ToughRock Fireguard C" manufactured by GP Building Products.
 - c. "Gold Bond Fire-Shield" and "Gold Bond Fire-Shield C" manufactured by National Gypsum Co.
 - d. "SHEETROCK "Firecode Core"" and "SHEETROCK "Firecode C Core""
 4. Requisite Properties:
 - a. Minimum Size: At least 4-foot by 8-foot sheets.
 - b. Minimum Thickness: At least 5/8-inch.
 - c. Core: Provide Type X panels in walls and Type C panels in ceilings, unless otherwise indicated on the Drawings.
 - d. Minimum Mass: At least 2.2 pounds per square foot.
 - e. Edges: Tapered long edges and square ends.
 - f. Facers: Paper face, back, and long edges.
- B. Mold- and Moisture-Resistant Fire-Resistance-Rated Gypsum Wall and Ceiling Board:
1. Description: Mold- and moisture-resistant and fire-resistance-rated gypsum board conforming to ASTM C 1396.
 2. Applications: Installed as the inside face of exterior wall assemblies; and in fire-resistance-rated and non-rated interior partition assemblies constructed in wet locations.
 3. Products: Provide one of the following, or equal.
 - a. "ProRoc Moisture and Mold Resistant Gypsum board with M2Tech" manufactured by CertainTeed Corp.
 - b. "ToughRock Mold-Guard" manufactured by GP Building Products.
 - c. "Gold Bond XP Gypsum Board" manufactured by National Gypsum Co.
 - d. "SHEETROCK Mold Tough" manufactured by USG Corp.
 4. Requisite Properties:
 - a. Minimum Size: At least 4-foot by 8-foot sheets.
 - b. Minimum Thickness: At least 5/8-inch.
 - c. Core: Provide Type X panels in walls and Type C panels in ceilings, unless otherwise indicated on the Drawings.
 - d. Minimum Mass: At least 2.2 pounds per square foot.
 - e. Edges: Tapered long edges and square ends.
 - f. Facers: Heavy-duty mold- and moisture-resistant paper face, back, and long edges.
 5. Performance Requirements:
 - a. Mold Resistance: Must earn a score of at least 10, when tested in conformance with ASTM D 3273.

2.4 METAL TRIM

A. Steel Trim:

1. Description: Paper-faced galvanized steel sheet trim pieces conforming to ASTM C 1047.
2. Manufacturers: Provide products manufactured by one of the following, or equal.
 - a. CEMCO.
 - b. Clinch-On Cornerbead Co.
 - c. Stockton Products.
 - d. Western Metal Lath.
 - e. USG Corp.
3. Products: "BEADEX" paper-faced metal bead and trim manufactured by USG Corp., or equal.
 - a. Corner Beads: Provide to protect exterior corners. Provide corner beads with notched or flexible flanges at curved edges.
 - 1) 90-degree Outside Corner Bead: "Micro Bead Style", or equal.
 - 2) 90-degree Inside Corner Bead: "B2 Style", or equal.
 - b. Casing Beads: Provide long-flanged L- or LC-beads at exposed panel edges indicated as receiving joint compound; provide short-flanged U-beads at exposed panel edges that do not receive joint compound.
 - 1) J Trims (J-shaped with exposed long flange): "B9J Style", or equal.
 - 2) L Trims (L-shaped with exposed long flange): "B4 Style", or equal.

B. Metal Control Joints:

1. Description: One-piece solid zinc control joint supplied with factory-applied removable tape to ensure a clean joint.
2. Products: Provide one of the following, or equal.
 - a. "NO93 Control Joint" manufactured by Alabama Metal Industries Corp. Building Products (AMICO).
 - b. "Niles-093 Zinc Control Joint" manufactured by Niles Building Products Co.
 - c. "SHEETROCK Zinc Control Joint No. 093" manufactured by USG Corp.
3. Requisite Properties:
 - a. Minimum Length: At least 10 feet long; provide longest possible lengths to minimize or avoid joints.

C. Decorative Aluminum Trim:

1. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.5 INSTALLATION MATERIALS

- A. Fasteners: Provide #6-32 UNC 2B (0.138-inch shank diameter, 32 threads per inch) by at least 1-1/4-inch long, Philips bugle head, coarse thread, self-piercing or self-drilling (as applicable) phosphate coated steel screw fasteners, unless another fastener type is

explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Laminating Adhesive:

1. Description: Lightweight, sandable, chemically-setting powder compound conforming to ASTM C 475.
2. Application: Used for bonding gypsum board to studs, laminating gypsum board to gypsum board, and bonding gypsum board to concrete or CMU walls.
3. Product: "SHEETROCK Easy Sand Joint Compound" manufactured by USG Corp., or equal.

2.6 JOINT TREATMENT MATERIALS

A. Joint Tape:

1. Description: Nominal 2-inch wide gypsum panel joint and corner reinforcement conforming to ASTM C 475.
2. Products:
 - a. Fiberglass Joint Tape: "SHEETROCK Fiberglass Drywall Tape" manufactured by USG Corp., or equal.
 - b. Paper Joint Tape: "BEADDEX Drywall Joint Tape" manufactured by USG Corp., or equal.
 - c. Fiberglass Mesh Tape: Prohibited.

B. Setting-Type Joint Compound:

1. Description: Lightweight, sandable, chemically setting powder compound conforming to ASTM C 475, and used for embedding joint tape and finishing interior gypsum panels.
2. Applications:
 - a. Pre-Filling Gypsum Panel Joints throughout the Project: Use setting-type compound for open joints, beveled panel edges, and at damaged surface areas at all locations.
 - b. All Other Coats: Use setting-type compound for embedding and first coat, fill coat, finish coat, and skim coat at wet locations; and at locations where panels are subject to moisture and high humidity.
3. Product: "SHEETROCK DURABOND" manufactured by USG Corp., or equal.

C. Drying-Type Joint Compound:

1. Description: Vinyl-type compound conforming to ASTM C 475, and used for embedding joint tape, finishing interior gypsum panels, and hand-applying simple texturing.
2. Application: Use for embedding and first coat, fill coat, finish coat, and skim coat at dry locations, and at locations where joint is subject to moisture and high humidity.
3. Product: "SHEETROCK All Purpose Joint Compound – SELECT" and "SHEETROCK Brand Plus 3 Lightweight All-Purpose Joint Compound" manufactured by USG Corp., or equal.

2.7 ACCESSORIES

- A. Texture Finish:
 - 1. Description: Unaggregated texture coating wall and ceiling texture.
 - 2. Restrictions: New concrete and new plaster must age at least 60 days before texturing.
 - 3. Concrete Crack Repair and Surface Preparation: Setting-type compound specified above.
 - 4. Primer: "SHEETROCK FIRST COAT Primer" manufactured by USG Corp., or equal.
 - 5. Texture Product: "SHEETROCK TUF-TEX" manufactured by USG Corp., or equal.
 - 6. Finish: Fine orange peel.
- B. Applied Level 5 Wallboard Finish Products: Prohibited.
- C. Repair Clips: "SHEETROCK Drywall Repair Clips" manufactured by USG Corp., or equal.
- D. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.8 MARKING AND IDENTIFICATION

- A. Description: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions, and other walls required by the International Building Code to have protected openings or penetrations must be effectively and permanently identified with stenciling located in accessible concealed floors, floor-ceiling assemblies, plenums, and attic spaces
- B. Paint Products: Specified in Section 09 91 00.
- C. Fire Walls, Fire Barriers, and Fire Partitions: Paint 6-inch high stripes not more than 15 feet from the end of each fire wall, fire barrier, or fire partition; and at intervals of not more than 30 feet, when measured horizontally along the wall, barrier, or partition. Paint stenciled letters over the 6-inch high stripes, leaving at least a one-inch border around the stenciled letter copy.
 - 1. Stripe Color: Match Federal Standard 595B color FS 31350 (red).
 - 2. Stenciled Letter Color: Match Federal Standard 595B color FS 37925 (insignia white).
 - 3. Stenciled Letter Font: 288-Point Linotype Neue Helvetica Regular Bold.
 - 4. Stenciled Letter Copy:
 - a. Fire Walls: "FIRE WALL – PROTECT ALL OPENINGS".
 - b. Fire Barriers: "FIRE BARRIER – PROTECT ALL OPENINGS".
 - c. Fire Partitions: "FIRE PARTITIONS – PROTECT ALL OPENINGS".
- D. Smoke Barriers and Smoke Partitions: Paint 6-inch high stripes not more than 15 feet from the end of each smoke barrier or smoke partition; and at intervals of not more than 30 feet, when measured horizontally along the wall, barrier, or partition. Paint stenciled

letters over the 6-inch high stripes, leaving at least a one-inch border around the stenciled letter copy.

1. Stripe Color: Match Federal Standard 595B color FS 36492 (gray).
2. Stenciled Letter Color: Match Federal Standard 595B color FS 37038 (black).
3. Stenciled Letter Font: 288-Point Linotype Neue Helvetica Regular Bold.
4. Stenciled Letter Copy:
 - a. Smoke Barriers: "SMOKE BARRIER – PROTECT ALL OPENINGS".
 - b. Smoke Partitions: "SMOKE PARTITIONS – PROTECT ALL OPENINGS".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 1. Install gypsum board using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 3. Installed gypsum board must be warrantable. Do not install, correct, or replace gypsum board in a manner that results in any warranty or guarantee becoming void.
- B. Special Techniques:
 1. Single-Layer Application:

- a. On ceilings, apply gypsum panels before wall or partition board application to greatest extent possible, and at right angles to framing, unless otherwise indicated.
 - b. On partitions and walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assemblies; minimize end joints.
 - c. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assemblies.
 - d. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - e. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - f. Securely attach gypsum panels to supports with steel drill screws.
2. Multilayer Application:
- a. On partitions and wall assemblies, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - b. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 - c. Securely attach base layers and face layers separately to supports with screws. Do not glue multiple layers of gypsum board together.
3. Trim:
- a. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim in conformance with manufacturer's instructions.
 - b. Control Joints: Install control joints in conformance with ASTM C 840 and in specific locations indicated or accepted by the Architect.
 - c. Trim: Install cornerbead at outside corners; install LC-Bead or U-Bead at exposed panel edges.
4. Finishing Gypsum Board:
- a. Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and other items and conditions as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
 - b. Prefill open joints, beveled edges, and damaged surface areas.
 - c. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- C. Acoustical Installation Requirements:
1. Comply with ASTM C 840.

2. Install panels with face side out. Butt panels together with light contact at edges and ends and not more than 1/16-inch of open space between panels. Do not force into place.
3. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided.
4. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
5. All joints must be staggered at least 24 inches apart and taped and sealed. Where multi-layer construction is indicated, each layer must be complete, including tape, fillers, and seals, before further layers are added
6. Joints between uncut sheet that lie in the same plane must be tight butt joints. The gap between sheets may not exceed 1/8-inch.
7. Tolerances: Install partitions with the following maximum gaps between gypsum board and abutting construction.
 - a. Floor: 1/4-inch.
 - b. Masonry and Concrete Walls: 1/4-inch.
 - c. Underside of Slab or Decking: 1/4-inch.
8. Damaged sheets may not be used. Joints between cut sheets that lie in the same plane or between any sheets that lie in different planes (i.e., at any angle or corner joint) must be cut back to produce a neat gap not more than 1/16-inch wide and the joint filled and sealed with specified non-hardening acoustic sealant. Subsequent layers must cover the joint and the opposite sheet must be cut short and filled and sealed.
9. In the first layer, all joints between boards must be backed by a continuous stud, noggin, bearer, or angle.
10. Specified batt insulation must be placed in the wall cavity and be suitably retained so that it is in contact with only one face of the partition and does not sag.
11. Wall ties between adjacent independent partitions must be of a resilient type and accepted by the Architect. The minimum number compatible with safe construction should be used.
12. The walls must be constructed from slab to slab (full height) unless otherwise indicated.
13. Where door frames are built into the wall, the vertical and horizontal sections of the frame shall be fully filled with plaster. The plaster joint shall be to the full depth of the wall.
14. Top and bottom of stud walls must be Isolated with resilient partition isolation pad (e.g., "Wallmat and Anchor Isolator" manufactured by Kinetics Noise Control, Inc., or equal)
15. Lateral support at the head of vibration isolated gypsum walls must be a continuous steel angle with a resilient pad to avoid rigid contact between the wall and the lateral support construction and accepted by the Architect. (e.g., wall mount type AB by Mason Industries, or equal)
16. All joints between gypsum and other constructions must be dense packed with fiberglass to the full depth of the wall and fully sealed with a sealant bonding to the gypsum and the other construction.

17. Where gypsum walls abut a profiled metal decking, the gypsum wall should seal to a minimum 16-gage steel plate attached to the deck, with the profile void above the plate filled with fiberglass and acoustically sealed on both sides with a fire barrier putty having a minimum density of 40 pounds per square foot. (e.g., 3M Moldable Putty or equal)
18. For top of walls that are perpendicular with the metal decking maximum of ½ inch gap from the flute and seal the openings with acoustical sealant.
19. Penetrations of building services (e.g., ducts, conduits, pipes) through full height and acoustic rated partitions must be sealed airtight in conformance with the following.
 - a. Seal all annular openings less than 1/2-inch with acoustical sealant and backer rod as required to hold sealant in place.
 - b. When the annular opening is larger than 1/2-inch, provide gypsum board patch to reduce the opening to less than 1/2-inch, and seal as above.
 - c. Prior to sealing penetrations, verify penetrating elements such as piping and ductwork are free and clear of the opening being sealed.
20. Cut-outs must be regular and may not fracture gypsum board core or tear covering and must conform to the following.
 - a. Minimize penetrations of insulated wall and ceiling construction. Penetrate only where necessary and fully seal airtight at the perimeter using acoustical sealant.
 - b. Where ducts and piping greater than 3-inches in diameter penetrate insulated wall or ceiling construction, provide a clearance of one-inch plus 1/4-inch at the perimeter of the penetration
 - c. Where conduit piping 3-inches diameter and less (including mechanical, hydraulic, plumbing, etc.) pass through insulated wall or ceiling construction, provide a clearance of 1/4-inch plus 1/8-inch between the conduit or piping and the structure, unless otherwise shown.
 - d. After the ductwork, conduit, or piping is installed, repair the gypsum board perimeter clearance to the specified tolerance as required. Where the clearance exceeds 3/4-inch, provide a sheet metal sleeve within the partition packed with safing insulation and seal both sides airtight with acoustical sealant.
 - e. Where penetration clearances are 3/8-inch or less, seal airtight with acoustical sealant at gypsum board. Where the perimeter clearance exceeds 3/8-inch, use a flexible backing rod to seal against.
 - f. All gypsum board penetrations (including those resulting from wiring, cables, and electrical junction boxes) must be sealed airtight with acoustical sealant.
 - g. The back and sides of junction boxes in sound-rated construction must be sealed airtight with sheet caulking. Seal perimeter face at gypsum board with acoustical sealant.
 - h. Recessed panel boards, equipment, boxes, and other items having a penetration area greater than 25 square inches at sound-rated partitions are fully enclosed and sealed with 5/8-inch thick gypsum board or 2 pound per square foot sheet metal.
 - i. Seal multiple conduit penetrations airtight with expanding fire foam sealant.

D. Interface with Adjacent Items:

1. Provide materials, components, and accessories normally furnished or necessary to securely attach gypsum board to supporting construction.
 2. Do not install vapor retarders directly behind gypsum board.
- E. Installation Tolerances: Install gypsum board to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed gypsum board in place from deterioration, and damage until Substantial Completion. Remove and replace wet, moisture-, or mold-damaged panels.
1. Indications panels are wet or moisture damaged include discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.
- B. Do not store anything adjacent to or against installed gypsum board unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed gypsum board as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

3.6 GYPSUM BOARD FINISH SCHEDULE

- A. General: Finish gypsum board surfaces with exposed joints, corners and edges reinforced or trimmed in conformance with ASTM C 840, Gypsum Association publication GA-214, *“Recommended Levels of Gypsum Board Finish”*, and the following.
- B. Levels of Gypsum Board Finish:
1. Level 0: Use for first layer of multiple layer construction and gypsum board ledge guards in elevator shafts.
 2. Level 1: Use in plenum areas above ceilings, interior faces of shafts, in attics, and in areas where the assembly will generally be concealed.
 3. Level 2: Use where moisture-resistant gypsum backing board is used as a substrate for tile; and in storage and similar areas where surface appearance is not of primary concern.
 4. Level 3: Use in areas where heavy grade wall coverings are to be applied as the final decoration.
 5. Level 4: Use in areas where light texture or backed lightweight wall covering is applied; and all areas indicated as receiving a paint finish, except where Level 5 finish is indicated.
 6. Level 5 (spray and roller-applied products are prohibited): Use where indicated on the Drawings.

END OF SECTION

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SECTION 09 30 00 – TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Tile surfacing units.
2. Thresholds.
3. Tile waterproofing.
4. Metal trim.
5. Installation materials.
6. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 05 16 for preparation of concrete slabs for finish flooring; and for remedial MVER products.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. TCNA: Tile Council of North America.

B. Definitions:

1. Manufacturer: Means the tile, installation material, or accessory manufacturer, as the context admits, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify chemical and adhesive compatibility of selected waterproofing and crack isolation membranes and mortar with installed curing compounds and moisture vapor emission control systems, based on current product formulations.
2. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified mortar and grout are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.

B. Preinstallation Meeting:

1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.

2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation.
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed tile. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

C. Sequencing:

1. Schedule tile deliveries to the project site only after the building is enclosed with a permanent enclosure; "wet work" within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install tile only after substrate is cured to a condition of equilibrium; is sufficiently dry to bond with tile; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible surface treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
3. Final light fixtures must be completely installed and energized before beginning installation.
4. Install tile only after penetrating items are installed and after overhead finishing operations are complete.

D. Scheduling:

1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
2. Access Restrictions: Close spaces during installation. Keep closed to foot traffic after installation for at least 48 hours and to rolling load traffic for at least 72 hours.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:

- a. Submit dimensioned plans and elevations drawn to scale and showing floor and wall design patterns and layouts.
 - b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.
 3. Samples: Submit at least 8-inch square representative samples of each tile variety for each specified color and finish, glued to hardboard backing. Grout all joints with specified grout.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished tile, installation materials, and accessories.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
- C. Maintenance Material Submittals: Before Final Completion, deliver to the Owner tile cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
 1. Furnish at least 2 percent of the total installed for each tile type, color, composition, grade, finish, and variety.
 2. Furnish at least 2 percent of the total amount installed for each grout type, color, and composition. but not less than one unopened container.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 1. Tile must be obtained through one source from the same supplier (to ensure compatibility and appearance).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Installation Materials (Setting Materials): Installation materials, including waterproofing membranes, crack isolation membranes, mortar, adhesive, grout, sealers, and other installation materials and accessories must be obtained through one source from the same manufacturer (to ensure compatibility and a warrantable installation).

3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Tile Floor Finish Regulatory Requirements:
1. Floor surfaces must be stable, firm, and slip resistant, conforming to the requirements of the International Building Code Section.
 2. Allowable Static Coefficient of Friction Value (SCOF): At least 0.6 for level surfaces and at least 0.8 for sloped surfaces, when measured in conformance with ASTM D 2047.
 3. Allowable Dynamic Coefficient of Friction Value (DCOF): Between 0.35 and 0.45, when measured in conformance with ANSI B101.3 under wet conditions.
 4. Radiant Flux Classification: Provide flooring having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.
- C. Tile Wall Finish Regulatory Requirements:
1. Surface-Burning Characteristics: Provide walls and ceilings having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.
- D. Quality Standards:
1. Installation Standards: Comply with parts of ANSI A108 Series publication requirements that apply to types of setting and grouting materials and to installation methods indicated.
 2. Installation Guidelines: Comply with TCNA publication "*Handbook for Ceramic, Glass, and Stone Installation*" requirements for installation methods indicated.
- E. Qualifications:
1. Installer: Company or individuals must have at least 5 years' experience installing tile for at least 30 previous projects similar to this project in size, material, design, and complexity.
 - a. Individuals must be Ceramic Tile Education Foundation (CTEF) Certified Tile Installers and current in their certification.
 - b. Individuals installing large format tile, mudwork for walls or floors, or waterproofing membranes must be certified through Advanced Certifications for Tile Installers (ACT) for installation and current in their certification.
 2. Supervisors: Individuals must have at least 7 years' experience installing tile for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading tile installers.
 - a. Supervisors must be Ceramic Tile Education Foundation (CTEF) Certified Tile Installers and current in their certification.
 - b. Supervisors of individuals installing large format tile, mudwork for walls or floors, or waterproofing membranes must be certified through Advanced Certifications for Tile Installers (ACT) for installation and current in their certification.

- F. Field Samples: Include *in-situ* mockups as part of the work of this specification section.
 - 1. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
 - 2. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of tile is made from field samples.
 - 3. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
 - 4. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 - 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 - 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 - 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
 - 1. Furnish adequate dunnage and bracing during storage.
 - 2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
 - 3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
 - 1. Avoid damage to packaging and containers, and contamination of contents.
 - 2. Rotate inventory; do not use items the shelf life of which is expired.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective materials with undamaged new materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install tile only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
- B. Existing Conditions:
 - 1. Substrate Dimensional Tolerances: Surfaces receiving tile must be flat with 1/4-inch within any 10-foot radius.
 - 2. Deflection: Maximum deflection of substrate system under positive or negative design loads must not exceed $L/360$ of span.
 - 3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.

1.8 WARRANTY

- A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for waterproofing products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 10 years.
- B. Installer Guarantee: Furnish to the Owner a written guarantee for waterproofing work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 TILE SURFACING UNITS

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.2 THRESHOLDS

- A. Marble Thresholds:
 - 1. Description: Marble conforming to ASTM C 503, Classification I (calcite), Soundness Group A (sound marbles with uniform and favorable working qualities; containing no geological flaws, voids, spalls, cracks, open seams, pits or other defects).
 - 2. Product: MSI Marble Threshold.
 - 3. Requisite Properties:
 - a. Size and Thickness: Indicated on the Drawings.
 - b. Color: Engineered white.
 - c. Finish: Polished.

2.3 METAL TRIM

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.4 INSTALLATION MATERIALS

- A. Manufactured Tub and Shower System:
 - 1. Description: Shower pans, wallboards, and accessories manufactured from closed-cell XPS foam insulation with a polymer-modified cement coating.
 - 2. Product: "HYDRO-BLOCK" shower system manufactured by HYDROBLOK International Ltd., or equal.
- B. Trowelable Patch and Fill Materials: Specified in Section 03 54 16, unless other products are supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- C. Moisture Vapor Transmission Reduction Coating: Specified in Section 03 35 10 (preventative) or Section 09 05 16 (remedial), unless another coating is supplied, required, recommended, accepted by the by manufacturer for actual in-service conditions applicable to the project.
- D. Fluid-Applied Waterproofing / Crack Isolation Membrane:
 - 1. Products: Provide one of the following, or equal.
 - a. "RedGard" elastomeric membrane manufactured by Custom Building Products.
 - b. "Laticrete HydroBan" manufactured by LATICRETE International, Inc.
 - c. "Mapelastic AquaDefense" manufactured by Mapei Corp.
 - 2. Accessories:
 - a. Primer: One-part waterproofing / crack isolation membrane diluted with 4 parts water and applied at a rate of 300 square feet per gallon of reduced material; or other substrate sealer or primer supplied, required, recommended, approved or accepted manufactured by the waterproofing/crack isolation membrane manufacturer.
 - b. Fiberglass Mesh: Provide manufacturer's standard alkali-resistant reinforcing mesh for changes of plane and for gaps 1/8-inch wide or greater.
 - c. Other Accessories: Provide other accessories and secondary items supplied, required, recommended, approved, or accepted manufactured by the waterproofing/crack isolation membrane manufacturer.
- E. Thin Bed Mortar (Thinset) Installations (horizontal applications between 3/32- and 3/16-inch thick after beat-in):
 - 1. Description: Premium-grade (best quality grade), single-component, ultra-high-performance, polymer-modified Portland cement mortar conforming to A118.15 shear bond strength requirements.

2. Application: Used for the installation of interior and exterior floor and wall vitreous, semi-vitreous or non-vitreous tile (ceramic, mosaic, quarry, and cement body tile); impervious porcelain tile; and natural stone veneer and stone tile.
 3. Products: Provide one of the following, or equal.
 - a. "FlexBond Crack Prevention Thin-Set Mortar" manufactured by Custom Building Products.
 - b. "254 Platinum" manufactured by LATICRETE International, Inc.
 - c. "Ultraflex 3" manufactured by Mapei Corp.
- F. Medium Bed Mortar Installations (horizontal applications between 3/8- and 3/4-inch thick after beat-in):
1. Description: Regular-setting, polymer-modified mortar conforming to A118.15 shear bond strength requirements.
 2. Application: Used for the installation of
 - a. large-format dimensional tile (greater than 12 by 12 inches);
 - b. inconsistent thickness natural stone; and
 - c. tiles and pavers having slight substrate irregularity.
 3. Products: Provide one of the following, or equal.
 - a. "Natural Stone & Large Tile Medium Mortar" manufactured by Custom Building Products.
 - b. "LATICRETE 4-XLT" manufactured by LATICRETE International, Inc.
 - c. "Ultraflex LFT" manufactured by Mapei Corp.
- G. Polymer-Modified Cementitious Sanded Grout:
1. Description: Premium-grade, pre-mixed, Portland cement sanded grout conforming to ANSI A118.7, and having a specifically-tailored, integrally-mixed antimicrobial agent.
 2. Application: Used for typical joints between 1/8- and 1/2-inch wide.
 3. Products: Provide one of the following, or equal.
 - a. "Prism Ultimate Performance Grout" manufactured by Custom Building Products.
 - b. "LATICRETE PermaColor" manufactured by LATICRETE International, Inc.
 - c. "Ultracolor Plus FA" manufactured by Mapei Corp.
 4. Colors: Indicated on the Drawings or selected by the Architect.
- H. Mix Water: Provide fresh, clean, clear, potable water from a domestic source. Water must conform to ASTM C 1602 and be free of oil, grease, waxy films, curing compounds, release agents, and other deleterious materials, including salts, acids, alkalis, organic materials, detergents, and other matter that might negatively affect tile quality, durability, appearance, or performance.

2.5 ACCESSORIES

- A. Trim Units: Coordinate with sizes and coursing of adjoining tile. Provide shapes indicated on the Drawings.

- B. Grout Release:
 - 1. Description: Temporary, water soluble, pre-grout coating.
 - 2. Application: Used to provide protection against grout & mortar staining.
 - 3. Products: Provide one of the following, or equal.
 - a. "Aqua Mix Grout Release" manufactured by Custom Building Products.
 - b. "STONETECH Grout Release" manufactured by LATICRETE International, Inc.
 - c. "UltraCare Grout Release" manufactured by Mapei Corp.
- C. Cleaner: Supplied, required, recommended, or accepted by the manufacturer for use on the installed tile and actual in-service conditions applicable to the project. Cleaners must remove stains, dirt, and residue without damaging or altering tile and grout surfaces.
- D. Grout Sealer: Manufacturer's standard product for sealing grout joints, which does not change either the color or appearance of installed grouts.
- E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.6 MIXING

- A. Site Mixing: Batch mix installation materials in conformance with manufacturer's instructions and other requirements and recommendations, using manufacturer-recommended techniques and manufacturer-recommended mechanical mixing equipment, which must be clean and free of material from previously mixed batches before charging each subsequent batch.
 - 1. Measure mix materials using only graduated mixing containers and calibrated mixing equipment. Shovels do not qualify as graduated mixing containers or calibrated equipment and are prohibited from measuring or dispensing mix materials.
 - 2. Thoroughly agitate and stir mix materials to a uniform and smooth consistency suitable for proper installation.
 - 3. Do not reduce, alter, or introduce foreign materials into mix materials, except in conformance with manufacturer's instructions and other requirements and recommendations.
 - 4. Do not use caked or lumpy materials; or materials that are irregular, too thick or too thin, or that are partially set.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations, including dimensional tolerances and deflection criteria.
2. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
3. Verify items penetrating tile are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

- A. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage; and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
- B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.
1. Remove substrate coatings and other substances that are incompatible with adhesives or that may negatively affect the quality of installation, durability, appearance, or performance of furnished tiling.
 2. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with leveling and patching compound. Apply, trowel, and float patching compound to achieve smooth, flat, hard surface. Prohibit traffic until patching compound is cured.
 3. Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16. Provide ICRI concrete surface profile CSP 3 to CSP 5 (light to medium shotblast between 10 and 40 mils), unless otherwise explicitly required, recommended, or accepted in writing by the waterproofing manufacturer.
 4. Vacuum-clean substrate.

3.3 INSTALLATION

A. General Requirements:

1. Install tile in conformance with the specified quality standards requirements using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

2. Set tile to line; plumb, level, and square without warp or lipping; with uniform, well-fitted joints and in alignment with adjacent construction
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed tile must be warrantable. Do not install, correct, or replace tile in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Install waterproofing/crack prevention membrane in conformance with ANSI A108.13 and the waterproofing/crack prevention manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.
2. Do not install tile over waterproofing/crack prevention membrane until membrane has cured and been tested to determine that it is watertight.
3. Install tile in conformance with the ANSI and TCNA quality standard publication requirements for wall installations.
4. Accurately form intersections and returns. Perform cutting and drilling without marring visible surfaces. Carefully grind cut edges abutting trim, finishes, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
5. Jointing Pattern: Lay tile in patterns as indicated on the Drawings.
 - a. Ensure tile are the same size and joints align when tile are installed against stone on floors, bases, walls, and trim.
 - b. Lay out and center tile in both directions in each space or on each wall area. Adjust to minimize cutting.
 - c. Provide uniform joint widths, unless otherwise indicated.
6. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, during installation..
 - a. Locate joints in tile surfaces directly above joints in concrete substrates.
 - b. Prepare joints and apply sealants in conformance with the requirements in Section 07 92 10.
 - c. Do not saw-cut joints after installing stones
7. Thresholds: Install thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
8. Grout tile in conformance with the ANSI and TCNA quality standard publication requirements.
9. Grout Sealer: Apply grout sealer to cementitious grout joints in conformance with the grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile by wiping with soft cloth.

- C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere tile to supporting construction.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean all visible tile surfaces in a manner that does not result in any warranty or guarantee becoming void.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed tile in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on, adjacent to or against installed tile unless they are protected from damage, as accepted in writing by the Architect. Do not use installed tile as work surfaces.

- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 51 13 – ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Suspended acoustical ceiling panels.
2. Suspension system.
3. Installation materials.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. CISCA: Ceilings & Interior Systems Construction Association.
2. ASW: American Steel and Wire Co.
3. SWG: Steel Wire Gauge.

B. Definitions:

1. Manufacturer: Means the acoustical ceiling manufacturer, unless otherwise indicated.
2. Ceiling: Means the ceiling finish and associated suspension systems.
3. Wire Gage (Steel Wire Gage): Means the diameter of steel wire, in inches, according to dimensions established by Washburn & Moen, Roebling, or American Steel and Wire Co.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate ceiling layout and installation with adjacent construction elements that penetrate ceilings, or is supported by them, including

1. light fixtures;
2. HVAC equipment;
3. fire-suppression system components;
4. partition assemblies; and
5. perimeter conditions.

B. Sequencing:

1. Schedule acoustical ceiling deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including

- concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; and storage areas are broom- and vacuum-clean.
2. Before beginning installation, final light fixtures must be completely installed, energized, and fully illuminated to at least the same type and level of illumination, and color temperature, maintained in the room or space after the building is occupied.
 3. Install acoustical ceilings only after penetrating items are installed.
 4. After acoustical ceiling installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.
- C. Scheduling: Allow sufficient time in the construction schedule to acclimate acoustical ceilings to specified ambient conditions for at least 48 hours before installation begins.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data:
 - a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings:
 - a. Submit dimensioned plans drawn to scale and showing acoustical ceiling layout, materials, joints, edge conditions, and finishes. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
 - b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans.
 3. Samples:
 - a. Submit at least 8-inch square representative samples of each acoustical ceiling variety for each specified color and finish.
 - b. Submit at least 8-inch long representative samples of each suspension system exposed tee, molding, and trim variety in each specified color and finish.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Coordination Drawings: Submit at least 1/4-inch scale dimensioned reflected ceiling plans showing the following items coordinated with each other, based on input from installers of each item involved.
 - a. Ceiling suspension system members.

- b. Method of attaching hangers to building structure. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - c. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
2. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished acoustical ceilings.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 3. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Maintenance Material Submittals:

1. Before Final Completion, deliver to the Owner acoustical ceiling cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
2. Furnish at least 2 percent of the total installed for each acoustical ceiling type, color, composition, grade, finish, and variety, but not less than one box or open container.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical ceilings must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Surface-Burning Characteristics: Provide acoustical ceilings having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.
2. Ceiling panels, other than acoustical panels, weighing more than 1/2-pound per square foot must be positively attached to ceiling suspension runners in conformance with International Building Code.

C. Quality Standards

1. Seismic Standard: Provide acoustical ceilings designed and installed to withstand the effects of earthquake motions in conformance with ASCE/SEI 7, "*Minimum Design Loads For Buildings and Other Structures*"; CISCA publication, "*Seismic Construction Handbook*"; and International Building Code.
2. Installation Standard: Comply with CISCA publication "*Ceiling Systems Handbook*" requirements for installation.

D. Qualifications:

1. Installer: Company or individuals must have at least 5 years' experience installing acoustical ceilings for at least 30 previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have at least 7 years' experience installing acoustical ceilings for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading acoustical ceiling installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
1. Furnish adequate dunnage and bracing during storage.
 2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
 3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective ceiling materials with undamaged new ceiling materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install acoustical ceilings only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
- B. Existing Conditions: Provide permanent lighting or illuminate work spaces to at least the same level occurring in the room or space after Final Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING PANELS

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.2 SUSPENSION SYSTEMS

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.3 INSTALLATION MATERIALS

- A. Attachment Devices: Sized for 5 times the design load indicated in ASTM C 635 Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.
- B. Wire: Soft temper, zinc-coated, pre-stretched, galvanized carbon steel wire conforming to ASTM A 641 Class 3 or A coating and having a minimum yield-stress load of 3 times the design load.
 - 1. Hanger Wire: Minimum 0.106-inch diameter. (ASW12)
 - 2. Diagonal Bracing Wire: Minimum 0.106-inch diameter. (ASW12)
 - 3. Provide heavier gage hanger wire for ceiling systems heavier than 4 pounds per square foot.
- C. Compression Struts: Provide one of the following.
 - 1. Cold or hot rolled angles, loadbearing or non-loadbearing studs, EMT or rigid conduit, or black iron.
 - 2. Cold-rolled steel section with maximum L/R ratio of not more than 200.
- D. Engineered Compression Struts:
 - 1. Description: Pre-engineered telescoping seismic compression posts manufactured from heavy-wall galvanized tubing.
 - 2. Application: Manufactured compression struts may be provided in lieu of compression struts indicated above when installed in conformance with its manufacturer's instructions.

3. Products: Provide one of the following, or equal.
 - a. "ARMSTRONG 5594 Ceiling Tile Compression Strut" manufactured by Armstrong World Industries, or equal.
 - b. "Donn Brand Compression Post VSA" manufactured by USG Interiors, Inc. (ICC ES Report No. ESR-1222), or equal.
- E. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 ACCESSORIES

- A. Seismic Clips:
 1. Description: 2-inch beam end retaining clip that joins main beam or cross tee to wall molding and web of grid with no visible pop rivets.
 2. Restrictions: Use of seismic clips is permitted only when specifically detailed on the Drawings. Alternative method of construction plan-review approval is required for use of seismic clips.
 3. Products: Provide one of the following, or equal.
 - a. "BERC 2" clips manufactured by Armstrong World Industries, or equal.
 - b. "ACM7" clips manufactured by USG Interiors, Inc., or equal.
- B. Seismic Separation Joints: Provide ceiling system manufacturer's standard at seismic separation joints at ceiling locations where the contiguous area of non-broken ceiling is 2,500 square feet or greater.
- C. Perimeter Wall Molding: Provide the following manufactured by Armstrong World Industries, or equal, with prefinished exposed flanges matching suspension system.
 1. Angle Molding: "No. 7808", or equal, 2-inch flange by 2-inch high hemmed edge molding.
 2. Shadow Molding: "No. 7823", or equal, 2-inch flange by 1-1/4-inch high by 3/4-inch reveal hemmed edge molding.
 3. Shadow Molding Installed with Seismic Clips:
 - a. Application: Compatible with Seismic Rx and BERC 2 clips.
 - b. Product: "No. 7897" 15/16-inch flange by 15/16-inch high by 1/2-inch reveal hemmed edge molding.
 4. Channel Molding: "No. 7834", or equal, 15/16-inch flange by 1-1/4-inch high by 1/2-inch reveal hemmed edge molding.
- D. Perimeter Trim: "Axiom Building Perimeter System" manufactured by Armstrong World Industries, or equal, for ACT ceiling tiles flush with adjacent gypsum board soffits.
- E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 - 1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
 - 2. Verify items penetrating acoustical ceilings are installed.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install acoustical ceilings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 - 3. Installed acoustical ceilings must be warrantable. Do not install, correct, or replace acoustical ceilings in a manner that results in any warranty or guarantee becoming void.
- B. Special Techniques:
 - 1. Suspend ceiling hangers from building's structural members.
 - a. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - b. Do not attach hangers to steel deck tabs. Do not attach hangers to steel roof deck. Attach hangers to structural members.

2. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or ceiling suspension system.
3. Space hangers not more than 48 inches on center along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - a. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - b. Where width of ducts and other construction within ceiling plenums produce hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - c. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by the quality standard publications.
4. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 - a. Secure wire hangers to ceiling suspension members and to supports above with at least 3 tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure bracing wires to ceiling suspension members and to supports with at least 4 tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.
6. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
7. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - a. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - b. Mechanically-fasten moldings to substrates at intervals not more than 16 inches on center and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - c. Do not use exposed fasteners, including pop rivets, on moldings and trim.
8. Install ceiling panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - a. Arrange directionally patterned ceiling panels as indicated on reflected ceiling plans. Install panels with pattern running in one direction parallel to short axis of space.
 - b. For square-edged panels, install with edges fully hidden from view by flanges of suspension system runners and moldings.

- c. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by ceiling panel manufacturer.
 - d. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.
- C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach acoustical ceilings to supporting construction.
- D. Installation Tolerances: Ceilings must conform to the following tolerances, which are non-cumulative.
 - 1. Maximum Out of Plane: Surfaces may not vary by more than 1/8-inch in 10 feet.
 - 2. Carrying Channel Maximum Out of Level: Not more than 1/8-inch in 12 feet,
 - 3. Main Runner Maximum Out of Level: Not more than 1/4-inch in 10 feet,
 - 4. Main Runner Maximum Deflection: Not more than L/360 of span,
 - 5. Maximum Misalignment of Main Runners: 0.015-inch.
 - 6. Maximum Misalignment of Intersection Members: 0.020-inch.
 - 7. Main Runner Bow, Camber, and Twist: Not more than 1/32-inch in 2 feet bow or camber; not more than one degree twist.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 - 1. written descriptions of non-conforming, damaged, and defective work;
 - 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 - 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: Clean all visible surfaces in a manner that does not result any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed acoustical ceilings in place from deterioration, and damage until Substantial Completion.
- B. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 65 14 – RESILIENT BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient wall base.
2. Installation materials.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the resilient base manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:

1. Schedule resilient base deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Final light fixtures must be completely installed and energized before beginning installation.
3. Install resilient base only after all other finishing operations are complete, especially overhead finishes.
4. After resilient base installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

B. Scheduling:

1. Acclimation: Allow sufficient time in the construction schedule to acclimate resilient base and installation materials to specified ambient conditions for at least 48 hours before installation begins.
2. Primer Installation: Resilient base must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer’s instructions for re-priming.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 - 1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 - 1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished resilient base and accessories.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 - 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
- C. Maintenance Material Submittals:
 - 1. Before Final Completion, deliver to the Owner resilient base cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
 - 2. Furnish at least 2 percent of the total installed for each resilient base type, color, composition, grade, finish, and variety, but not less than one unopened box or container.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Resilient base must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 - 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Regulatory Requirements:

1. Surface-Burning Characteristics: base having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.
2. Radiant Flux Classification: resilient accessories having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.

C. Qualifications:

1. Installer: Company or individuals must have at least 5 years' experience installing resilient base for at least 30 previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have at least 7 years' experience installing resilient base for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading resilient base installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped, upright in their original containers, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas. Promptly remove and replace rolled products that are flattened or distorted during shipping, unloading, or storage.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations.
 1. Avoid damage to containers and contamination of contents.
 2. Rotate inventory; do not use items the shelf life of which is expired.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective resilient base with undamaged new resilient base that do not exhibit deterioration, damage, or defects, including rolled sheet products that are flattened or distorted during shipping, unloading, or storage.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install resilient base only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions:

1. Surface Conditions: Surfaces receiving resilient base must be dry. Install resilient base only when substrate moisture content, vapor emission rate, and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.
3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.

- C. Other Conditions: Do not apply resilient base where dust is generated, or liquids are sprayed.

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.2 INSTALLATION MATERIALS

- A. Primer: Water-based, low- or zero-VOC, solvent-free primer supplied, required, recommended, or accepted by the manufacturer for in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.
- B. Adhesive:
1. Water-based, low- or zero-VOC adhesive supplied, required, recommended, or accepted by the manufacturer for ease of installation; and for adequate bonding of resilient base to substrates for all in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.
 2. Wet-tack, percent solids, open-time, stripability, and ease of application must be explicitly formulated for each resilient base type and application.
 3. Provide hard-set adhesive supplied, required, recommended, or accepted by the manufacturer under resilient base subject to concentrated static or dynamic rolling loads.

2.3 ACCESSORIES

- A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 - 1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations. Verify wall surfaces and flooring are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
 - 2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with resilient base adhesion, appearance, or performance.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

- A. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

- A. General Requirements:
 - 1. Install resilient base using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

2. Only install resilient base under conditions that ensure finishes are free from blemishes and defects.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed resilient base must be warrantable. Do not install, correct, or replace resilient base in a manner that results in any warranty or guarantee becoming void.

B. Resilient Base Special Techniques:

1. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
2. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
3. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
4. Do not stretch resilient base during installation.
5. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
6. Use straight pieces of maximum lengths possible to form corners; form without producing discoloration (whitening) at bends.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere resilient base to supporting construction.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean all visible resilient base surfaces in a manner that does not result in any warranty or guarantee becoming void.
 - 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 - 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 - 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 - 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed resilient base in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on, adjacent to, or against installed resilient base unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed resilient base as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 65 16 – RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient sheet flooring.
2. Surface preparation.
3. Installation materials.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 05 16 for preparation of concrete slabs for finish flooring; and for remedial MVER products.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. ICRI: International Concrete Repair Institute, Inc.
2. MVER: Moisture Vapor Emission Rate.
3. RFCI: Resilient Floor Covering Institute.

B. Definitions:

1. Manufacturer: Means the resilient sheet flooring manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Concrete Substrates:
 - a. Verify chemical and adhesive compatibility of selected flooring adhesives with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.
 - b. Coordinate existing concrete subfloor surface flatness and levelness with ACI 117 requirements, measured in conformance with ASTM E 1155 (3D laser scanning or Allen Face F-Meter methods), and tolerances required, recommended, or accepted by the flooring manufacturer.
2. Wood Substrates: Verify all wood sub floors are double-layer construction, are suspended at least 18 inches above grade, and have adequate cross-ventilation.

B. Preinstallation Meeting:

1. Resilient sheet flooring manufacturer's representative and installer must attend the preinstallation meeting.
2. Schedule a separate additional preinstallation meeting between the Contractor, the Architect, resilient sheet flooring manufacturer's representatives and installers, and the entities and individuals responsible for conducting concrete substrate testing.
3. Hold the meeting after submittal approval and at least 10 business days before beginning installation.
4. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including subfloor surface flatness and levelness, and special details and conditions that might affect installation.
5. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed resilient sheet flooring. Resolve each condition.
6. Finalize construction schedule.
7. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

C. Sequencing:

1. Schedule resilient sheet flooring deliveries to the project site only after the building is enclosed with a permanent enclosure; "wet work" within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install resilient sheet flooring only after substrate is cured to a condition of equilibrium; is sufficiently dry to bond with resilient sheet flooring adhesives; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
3. Final light fixtures must be completely installed and energized before beginning installation.
4. Install resilient sheet flooring only after penetrating items are installed.
5. Install resilient sheet flooring only after all other finishing operations are complete, especially overhead finishes.
6. After resilient sheet flooring installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

D. Scheduling:

1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.

2. **Acclimation:** Allow sufficient time in the construction schedule to acclimate resilient sheet flooring and installation materials to specified ambient conditions for at least 48 hours before installation begins.
3. **Primer Installation:** Resilient sheet flooring must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
4. **Access Restrictions:** Close spaces during installation; keep closed to foot traffic after installation for at least 48 hours and to rolling traffic for at least 72 hours.

1.4 SUBMITTALS

- A. **Action Submittals:** Submit the following for responsive action (formal review and approval).
 1. **Product Data:** Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. **Shop Drawings:**
 - a. Submit dimensioned plans drawn to scale and showing resilient sheet flooring custom patterns and inlays, and seam layouts.
 - b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans.
 3. **Material Samples:**
 - a. Submit at least 8-inch square representative samples of each resilient sheet flooring color, finish, and variety.
 - b. Submit at least 8-inch long representative samples of each welding rod selected or required for each resilient sheet flooring color, finish, and variety.
 4. **Seam Samples:**
 - a. Submit at least 8- by 10-inch samples of each seam required for each resilient sheet flooring color, finish, and variety, with seam in center of each sample.
 - b. Samples are representative samples of actual finishes, and must be prepared by the same installer's personnel designated to perform the work of this specification section.
- B. **Informational Submittals:** Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. **Manufacturer's Instructions:** Submit manufacturer-prepared published instructions for proper installation of furnished resilient sheet flooring.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.

- b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
- C. Closeout Submittals: Submit copies of manufacturer's instructions and other requirements and recommendations for resilient sheet flooring maintenance, cleaning, and repair to the Architect as a condition of project closeout.
- D. Maintenance Material Submittals:
 1. Before Final Completion, deliver to the Owner resilient sheet flooring cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
 2. Furnish at least 2 percent of the total installed for each resilient sheet flooring type, color, composition, grade, finish, and variety, but not less than one unopened box or container.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 1. Resilient sheet flooring must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Regulatory Requirements:
 1. Resilient sheet flooring must be stable, firm, and slip resistant, conforming to the requirements of the International Building Code.
 2. Radiant Flux Classification: Provide resilient sheet flooring having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.
 3. Allowable Static Coefficient of Friction Value (SCOF): At least 0.6 for level surfaces and at least 0.8 for sloped surfaces, when measured in conformance with ASTM D 2047.
 4. Allowable Dynamic Coefficient of Friction Value (DCOF): Between 0.35 and 0.45, when measured in conformance with ANSI B101.3 under wet conditions.
- C. Quality Standards:
 1. Resilient Sheet Flooring Installation Standard: Comply with Resilient Floor Covering Institute publication RFCI IP #1, "*Recommended Installation Practice for*

Homogeneous Sheet Flooring, Fully-Adhered” requirements that apply to each in-service condition indicated.

2. Material Standard: Resilient sheet flooring must be independently tested and certified by Scientific Certification Systems (SCS) in conformance with FloorScore requirements for indoor air quality emissions.

D. Qualifications:

1. Installer: Company or individuals must have at least 5 years’ experience installing resilient sheet flooring for at least 30 previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have at least 7 years’ experience installing resilient sheet flooring for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years’ supervisory experience directing and leading resilient sheet flooring installers.

- E. Custom Patterns and Inlays: Resilient sheet flooring must be laser-cut. Field cutting is prohibited.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Sheet products must be tightly rolled face out on a sturdy core designed for that purpose and vertically stored unless otherwise required or recommended by the manufacturer. Promptly remove and replace rolled sheet products that are flattened or distorted during shipping, unloading, or storage.
4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

- C. Handling: Handle items in conformance with manufacturer’s instructions and other requirements and recommendations, and in a manner that that prevents damage.

1. Avoid damage to packaging and containers, and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective resilient sheet flooring materials with undamaged new resilient sheet flooring materials that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install resilient sheet flooring only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
- B. Existing Conditions:
 - 1. Surface Conditions: Surfaces receiving resilient sheet flooring must be dry. Install resilient sheet flooring only when substrate moisture content, vapor emission rate, and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
 - 2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.
 - 3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.

PART 2 - PRODUCTS

2.1 RESILIENT SHEET FLOORING

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.2 SURFACE PREPARATION

- A. Substrate Testing and Surface Preparation: Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16.

2.3 INSTALLATION MATERIALS

- A. Trowelable Patch and Fill Materials: Specified in Section 03 54 16, unless other products are supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

- B. Moisture Vapor Transmission Reduction Coating: Specified in Section 09 05 16 (remedial), unless another coating is supplied, required, recommended, accepted by the by manufacturer for actual in-service conditions applicable to the project.
- C. Primer: Water-based, low- or zero-VOC, solvent-free primer supplied, required, recommended, or accepted by the manufacturer for in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.
- D. Adhesive:
 - 1. Water-based, low- or zero-VOC adhesive supplied, required, recommended, or accepted by the manufacturer for ease of resilient sheet flooring installation; and for adequate bonding of resilient sheet flooring to substrates for all in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.
 - 2. Wet-tack, percent solids, open-time, stripability, and ease of application must be explicitly formulated for each resilient sheet flooring type and application.
 - 3. Provide hard-set adhesive supplied, required, recommended, or accepted by the manufacturer under resilient sheet flooring subject to concentrated static or dynamic rolling loads.
- E. Integral Flash Cove Base Accessories: Provide the following manufactured by Johnsonite, or equal.
 - 1. Cove Filler Strips:
 - a. 1-3/4-inch Radius: "Model No. CFS-00", or equal.
 - b. 1-1/4-inch Radius: "Model No. CFS-00-A", or equal.
 - c. One-inch Radius: "Model No. CFS-00-M", or equal.
 - 2. Cove Caps: "Model No. SCC-55-A", or equal.
- F. Welding Rods:
 - 1. Description: Manufacturer's standard solid-strand, solidified adhesive, through-color welding rods. Match flooring color, pattern, and appearance.
 - 2. Colors: Match flooring.
 - 3. Requisite Properties:
 - a. Provide matching solid colors for solid color flooring.
 - b. Provide pattern-matching non-solid colors for patterned flooring.

2.4 ACCESSORIES

- A. Subfloor Leveler System:
 - 1. Products: Provide the following manufactured by Johnsonite, or equal.
 - a. Reduces 1/8-inch to Zero: "Model No. LS-40-F", or equal.
 - b. Reduces 1/4-inch to Zero (can be cut at score line to reduce height as indicated): "Model No. LS-40", or equal.

- c. Reduces 1/4-inch to Zero (leveled edge for tack strip installation): "Model No. LS-40-K", or equal.
 - d. Reduces 3/8-inch to Zero (can be cut at score line to reduce height as indicated): "Model No. LS-40-D", or equal.
 - e. Reduces 1/2-inch to Zero (can be cut at score line to reduce height as indicated): "Model No. LS-40-E", or equal.
 - f. Reduces 3/4-inch to Zero: "Model No. LS-40-G", or equal.
 - g. Reduces 3/8-inch to 1/4-inch (can be used alone or with LS-40 to extend transition): "Model No. LS-40-B", or equal.
 - h. Reduces 1/2-inch to 3/8-inch (can be used alone or with Model Nos. "LS-40-D" or "LS-40-D" to extend transition): "Model No. LS-40-C", or equal.
- B. Leveling Paper:
1. Application: Used to align finish surfaces of 2.0mm and 3.0mm flooring.
 2. Description: Kraft or felt paper supplied, required, recommended, or accepted by the manufacturer.
- C. Cleaner: Supplied, required, recommended, or accepted by the manufacturer for use on the installed resilient sheet flooring and actual in-service conditions applicable to the project. Cleaners must remove stains, dirt, and residue without damaging or altering resilient sheet flooring surfaces.
- D. Floor Polish: Protective liquid polish products supplied, required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
- E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
 2. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.

3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with resilient sheet flooring adhesion, appearance, or performance.
4. Verify items penetrating resilient sheet flooring are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and resilient sheet flooring installation. Control and collect dust produced by grinding operations.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage, and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

1. Remove substrate coatings and other substances that are incompatible with adhesives or that may negatively affect the quality of the installation, durability, appearance, or performance of either the furnished resilient sheet flooring or adhesives.
2. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with patch and fill materials. Apply, trowel, and float patch material to achieve smooth, flat, hard surface. Prohibit traffic until patch material is cured.
3. Perform testing, corrective work, and substrate preparation specified in Section 09 05 16.
4. Vacuum-clean substrate.

C. Bond Test: Perform and document bond tests as required, recommended, or accepted by the manufacturer, must be performed and documented before beginning installation.

3.3 INSTALLATION

A. General Requirements:

1. Install resilient sheet flooring using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install resilient sheet flooring under conditions that ensure finishes are free from blemishes and defects.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed resilient sheet flooring must be warrantable. Do not install, correct, or replace resilient sheet flooring in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Scribe, cut, and fit resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
2. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings. Extend resilient sheet flooring to centerline of doors in the closed position.
3. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use pencil, chalk, or other nonpermanent, non-staining marking device. The use of markers is prohibited.
4. Adhere resilient sheet flooring to substrate using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
5. For seamless resilient sheet flooring installation, rout seams and weld together with coordinated color heat welding rod in conformance with the manufacturer's instructions.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere resilient sheet flooring to supporting construction.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and

3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean all visible resilient sheet flooring surfaces in a manner that does not result in any warranty or guarantee becoming void.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed resilient sheet flooring in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on, adjacent to, or against installed resilient sheet flooring unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed resilient sheet flooring as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 81 33 – ACOUSTICAL INSULATION, SEALANTS, AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concealed acoustical insulation.
2. Acoustical sealants.
3. Acoustical spray.
4. Firestop and acoustical putty pads.
5. Installation materials.
6. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the acoustical insulation or accessory manufacturer, as the context admits, manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. CPVC Coordination: Not all CPVC products are identical. Different CPVC products from different manufacturers may vary in molecular weight, chlorine content and compound additives.

1. Verify selected CPVC product compatibility with all products that may come into contact with selected CPVC, even if contact is inadvertent.
2. Determine chemical composition of CPVC materials and compatibility of selected paints and sealants with selected CPVC materials.
3. Only apply ancillary products that are specifically approved for use on the specific brand of CPVC selected for the project.
4. If an ancillary product is not on a compatibility list, contact the CPVC manufacturer before use. Never assume the absence of a prohibition indicates suitability.
5. Natural oil (vegetable oil or animal fat) and synthetic ester oils, or items containing natural or synthetic oil are prohibited from contacting CPVC.
6. Plasticizers found in certain materials, including incompatible sealants, are prohibited from contacting CPVC.
7. Surfactants found in certain materials, including soaps and detergents, are prohibited from contacting CPVC.

8. Fungicides sprayed on surrounding drywall and wood framing to prevent growth of mold and mildew, are prohibited from contacting CPVC.
9. Scented products, including cologne, perfume, or essential oils (e.g., peppermint oil, orange oil, spearmint oil, etc.), are prohibited from contacting CPVC. (Sometimes used for the purpose of being able to detect leaks by odor)
10. Jacketing on signal-carrying wiring systems often contains plasticizers that are prohibited from contacting CPVC.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
- B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Submit manufacturer-prepared published instructions for proper installation of furnished insulation.
 2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items as shipped, upright in their original containers, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.
- C. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.
- D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.6 PROJECT CONDITIONS

- A. Existing Conditions: Surfaces receiving acoustical insulation must be dry.

PART 2 - PRODUCTS

2.1 CONCEALED ACOUSTICAL INSULATION

A. Acoustical Blanket Insulation:

1. Description: Unfaced inorganic glass-fiber blanket acoustical insulation conforming to ASTM C 665 Type I acoustical insulation (blankets without membrane coverings).
2. Manufacturers: Provide one of the following, or equal.
 - a. "CertaPro AcoustaTherm" manufactured by CertainTeed Corp.
 - b. "Sound Control Batts" manufactured by Johns Manville.
 - c. "Sound Attenuation Batts/MW" manufactured by Owens Corning Fiberglass Corp.

B. Sound Attenuating Fire Blanket Insulation:

1. Description: Asbestos-free mineral fiber blanket acoustical insulation conforming to ASTM C 665 requirements for Type I acoustical insulation (blankets without membrane coverings), manufactured from slag and naturally occurring rock.
2. Products: Provide one of the following, or equal.
 - a. "FIBREX Sound Attenuation Fire Batt Acoustical insulation (SAFB)" manufactured by Fibrex Insulations Inc.
 - b. "Thermafiber Sound Attenuating Fire Blankets (SAFB)" manufactured by Owens Corning.
 - c. "ROCKWOOL AFB" manufactured by Roxul Inc.

2.2 ACOUSTICAL SEALANTS

A. Latex Sealants:

1. Description: Non-sag, paintable, non-staining siliconized acrylic-latex sealant conforming to ASTM C 834 requirements for Type OP (opaque sealant), Grade NF (does not meet the requirements for low temperature flexibility of Grade 0°C classification). Verify material compatibility with adjacent materials such as chlorinated polyvinyl chloride (CPVC) pipe.
2. Application: Used where indicated at exposed and concealed joints and annular spaces around through-penetrations.
3. Products: Unless another type is required, recommended, or accepted by the CPVC item manufacturer, provide one of the following, or equal.
 - a. "CP 506 Smoke and Acoustic Sealant" manufactured by Hilti, Inc.
 - b. "QuietZone Acoustic Sealant" manufactured by Owens Corning.
 - c. "AC-20 FTR" manufactured by Pecora Corp.

- d. "Tremflex 834" manufactured by Tremco, Inc.
- e. "Sheetrock Acoustical Sealant" manufactured by USG Corp.
4. Requisite Properties:
 - a. Color: White.
- B. Non-Drying, Non-Hardening, Non-Skinning Sealants:
 1. Description: Single-component butyl rubber sound dampening elastomeric sealant conforming to ASTM Standard D 217. Verify material compatibility with adjacent materials such as chlorinated polyvinyl chloride (CPVC) pipe.
 2. Application: Installed at concealed joints where indicated.
 3. Products: Unless another type is required, recommended, or accepted by the CPVC item manufacturer, provide one of the following, or equal.
 - a. "BA-98" manufactured by Pecora Corp.
 - b. "QuietSeal Acoustical Sealant QS-350" manufactured by Serious Materials, Inc.
 - c. "Acoustical Sealant" manufactured by Tremco, Inc.
- C. Fire Rated, Non-Hardening,, Sealant:
 1. Description: Verify material compatibility with adjacent materials such as chlorinated polyvinyl chloride (CPVC) pipe.
 2. Products: Unless another type is required, recommended, or accepted by the CPVC item manufacturer, provide one of the following, or equal.
 - a. "Fire Barrier 2001 Silicone RTV Foam" manufactured by 3M.
 - b. "CP 601S Elastomeric Firestop Sealant" manufactured by HILTI.
 - c. "Firetemp CI Caulk" manufactured by Johns Manville.
 - d. "Spec Seal ES100" manufactured by Specified Technologies, Inc.
- D. Expanding Foam Sealant:
 1. Description: Gun-applied, expanding spray foam sealant. Verify material compatibility with adjacent materials such as chlorinated polyvinyl chloride (CPVC) pipe
 2. Application: Used to seal and insulate around common areas of energy loss, including foundation/sill plates, outdoor fixtures, pipe penetrations, etc.
 3. Products: Unless another type is required, recommended, or accepted by the CPVC item manufacturer, provide one of the following, or equal.
 - a. "GREAT STUFF PRO Gaps & Cracks" manufactured by The Dow Chemical Co.
 - b. "Polycell" manufactured by M-D Building Products, Inc.
 - c. "Expanding Foam Polyfilla" manufactured by Polyfilla.
- E. Cementitious Sealant: "Monokote Z-146" manufactured by GCP Applied Technologies, Inc., or equal.
- F. Preformed Tape Sealants:
 1. Fire-Resistance Rated Conditions:

- a. Description: Compressible, self-extinguishing, UL-listed closed cell polyvinyl chloride foam tape with pressure sensitive adhesive.
 - b. Application: Installed at concealed joints in fire-resistance rated construction, where indicated.
 - c. Product: "Norseal V740FR" manufactured by Norton Performance Plastics Corp., or equal.
 - d. Requisite Properties:
 - 1) Size: One-inch minimum roll width, unless another width is indicated on the Drawings.
 - 2) Thickness: At least 1/8-inch, unless another thickness is indicated on the Drawings.
 - 3) Density: At least 9 pounds per cubic foot.
 - 4) Facing: Furnish tape in rolls with protective release liner on non-adhesive face.
2. Elsewhere:
- a. Description: Compressible, closed cell polyvinyl chloride foam tape with pressure sensitive adhesive.
 - b. Application: Installed at concealed joints, where indicated.
 - c. Product: "Norseal V730" manufactured by Norton Performance Plastics Corp., or equal.
 - d. Requisite Properties:
 - 1) Size: One-inch minimum roll width.
 - 2) Thickness: At least 3/8-inch.
 - 3) Density: At least 6 pounds per cubic foot.
 - 4) Facing: Furnish tape in rolls with protective release liner on non-adhesive face.

2.3 ACOUSTICAL SPRAY

- A. Description: Sprayable acrylic latex material.
- B. Application: Used where indicated at exposed and concealed static or minimally dynamic joints or gaps in wall construction.
- C. Products: Provide one of the following, or equal.
 1. "CP 572 Smoke and Acoustic Spray" or "CFS-SP WB Firestop Joint Spray" manufactured by Hilti, Inc.
 2. "Spec Seal Smoke 'N' Sound Sealant" manufactured by Specified Technologies, Inc.
 3. "TREMstop Smoke & Sound Sealant" or "TREMstop Acrylic" manufactured by Tremco, Inc.
- D. Requisite Properties:
 1. Spray must be mold and mildew resistant in conformance with ASTM G21.
 2. Spray must have a minimum movement capability of at least 12.5 percent.

2.4 FIRESTOP AND ACOUSTICAL PUTTY PADS

- A. Description: Sound deadening pads.
- B. Application: Used to seal the external surfaces (back side) of metallic and nonmetallic switch and receptacle boxes to reduce airborne sound transmission in interior partitions.
- C. Fire-Resistance Rated Construction (Firestop Putty Pads): Provide one of the following, or equal.
 - 1. "CP 617 Firestop Putty Pads" manufactured by Hilti, Inc.
 - 2. "Putty Pads" manufactured by International Protective Coatings
 - 3. "Type FSP Firestop Putty" pads by Nelson Electric.
 - 4. "Putty Pads" manufactured by Specified Technologies, Inc.
 - 5. "TREMstop MP" manufactured by Tremco, Inc.
- D. Elsewhere (Acoustical Putty Pads): Provide one of the following, or equal.
 - 1. "Lowry Box Pads" manufactured by Henry A. Lowry Co.
 - 2. "Sound Pad #68" manufactured by LH Dottie Co.

2.5 INSTALLATION MATERIALS

- A. Acoustical Insulation Hangers:
 - 1. Application: Used to attach acoustical insulation to clean, dry, smooth, non-porous solid surfaces.
 - 2. Manufacturer: Provide products manufactured by AGM Industries, Inc., or equal.
 - 3. Products: Provide the following, or equal.
 - a. Anchors: "TACTOO Insul-Hangers" adhesively attached spindle-type anchors.
 - b. Adhesive: "BOSS 348 Multi-Purpose Construction Adhesive" manufactured by Accumetric, LLC or other VOC-compliant acoustical insulation hanger adhesive.
 - c. Acoustical insulation Standoff: One-inch "Clutch Clip".
 - d. Acoustical insulation Retaining Washers: "Style RC 200" round or "SC 250" square washers.
 - 4. Requisite Properties:
 - a. Base Plate and Acoustical insulation Standoff and Retaining Washers: At least 2-inch square by at least 0.149-inch (MSG 28) base metal thickness galvanized perforated steel sheet.
 - b. Retaining Washers: At least 1-1/2-inch square or diameter by at least 0.149-inch (MSG 28) base metal thickness galvanized perforated steel sheet.
 - c. Spindle: At least 0.106-inch diameter (SWG 12), zinc-coated wire, depth to suit depth of acoustical insulation indicated.
 - d. Adhesive: Adhesive used with impaling pins must either be manufactured or accepted by the acoustical insulation hanger manufacturer. "Peel and press" hangers with self-adhering adhesive backings are prohibited.

- B. Mechanical Fasteners: Tape, staples, and other devices for fastening acoustical insulation supplied, required, recommended, or accepted by the acoustical insulation manufacturer.
- C. Hanger Wire: At least 0.106-inch diameter (SWG 12) soft temper zinc-coated wire conforming to ASTM A 641, Class 3 or A coating.
- D. Adhesive: Supplied, require, recommended, or accepted by the acoustical insulation manufacturer to bond acoustical insulation securely to substrates indicated without damaging acoustical insulation or substrates.

2.6 ACCESSORIES

- A. Joint Backing:
 - 1. Description: Extruded closed-cell polyethylene foam cylindrical sealant backings conforming to ASTM C 1330, Type C.
 - 2. Products: Provide one of the following, or equal.
 - a. "Mile High Foam" manufactured by Backer Rod Mfg. Inc.
 - b. "HBR" or "Green Rod" manufactured by Nomaco, Inc.
 - c. "NuFlex 870" manufactured by TVM Building Products.
 - 3. Performance Requirements:
 - a. Maximum Water Absorption: Not more than 0.10 grams per cubic centiliter when tested in conformance with conformance with ASTM C 1016, Procedure B.
 - b. Minimum Density: At least 24 per cubic meter when tested in conformance with conformance with ASTM D 1622.
 - c. Maximum Outgassing: Less than 1 bubble when tested in conformance with conformance with ASTM D 1253.
 - d. Minimum Compression Recovery: At least 90 percent, when tested in conformance with conformance with ASTM D 5249.
 - e. Minimum Compression Deflection: At least 20.5 percent, when tested in conformance with conformance with ASTM D 5249.
 - f. Minimum Tensile Strength: At least 200 kPa, when tested in conformance with conformance with ASTM D 1623.
- B. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install acoustical insulation using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Extend acoustical insulation to envelop entire area insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
 - 3. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of acoustical insulation to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
 - 4. Installed acoustical insulation must be warrantable. Do not install, correct, or replace acoustical insulation in a manner that results in any warranty or guarantee becoming void.
- B. Special Techniques:
 - 1. Wall Insulation:
 - a. Install acoustical insulation in cavities formed by framing members.
 - b. Use acoustical insulation that fills the cavities. If more than one length is required to fill the cavities, then provide lengths that will produce a snug fit between ends.
 - c. Place acoustical insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - d. Maintain 3-inch clearance around recessed lighting fixtures not rated for or protected from contact with acoustical insulation.
 - e. Stuff loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to roughly 40 percent of normal maximum volume.
 - f. For metal-framed wall cavities higher than 96 inches, support unfaced blankets mechanically and support faced blankets by taping insulation flanges to metal stud flanges.
 - 2. Ceiling Insulation:
 - a. Install blanket acoustical insulation above ceilings where indicated.

- b. Maintain 3-inch clearance of acoustical insulation around recessed lighting fixtures.
 - 3. Acoustical Sealant Installation:
 - a. At sound-rated assemblies and elsewhere indicated, seal construction in conformance with ASTM C 919 with a continuous bead of acoustical sealant at perimeter, behind control joints, and at openings and penetrations.
 - b. Install acoustical sealant to both faces of partitions at perimeters and through penetrations.
- C. Acoustical Installation Requirements:
 - 1. Application: Apply acoustical sealant where shown on drawings and the following.
 - a. Both sides and perimeter of door and window frames.
 - b. Penetrations of partitions, floors, and ceilings by piping, ventilation ducts, conduits, cables, and cable trays.
 - c. Perimeter and between joints of all sound isolating partitions, floors, and ceilings.
 - 2. Acoustical Sealant:
 - a. Use continuous beads of acoustical sealant along gypsum board face layer to seal assemblies at head, sill, perimeter, and penetrations, and joints between layers of sound isolating gypsum board construction and around the perimeter of resilient ceilings.
 - b. Comply with ASTM C 919 requirements for use of joint sealants in acoustical applications as applicable to materials and conditions indicated.
 - 3. Sheet Sealant:
 - a. In full full height, sound rated, and sound sensitive walls, over back and sides of all electrical, telephone, and communication boxes with specified acoustical pads.
 - b. Verify unused knockouts are plugged before installing the pads. Mold pads tightly to the boxes and to the adjacent surfaces.
 - 4. Installation:
 - a. To seal gaps 3/8-inch in dimension and larger, pack with glass/mineral fiber batt prior to installing sealant materials.
 - b. Use compressible closed-cell foam backer rod as required. Uncompressed backer rod width should be 30 to 50 percent greater than joint width.
- D. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach acoustical insulation to supporting construction.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 - 1. written descriptions of non-conforming, damaged, and defective work;
 - 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 - 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed acoustical insulation in place from becoming wet, deterioration, and damage until covering.
- B. Do not store anything adjacent to or against installed acoustical insulation unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed acoustical insulation as work surfaces.
- C. Remove protection when it's no longer needed and before covering.

END OF SECTION

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SECTION 09 91 00 – PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Field-applied finish paint.
2. Surface preparation.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. DFT: Dry Film Thickness.
2. GU: Gloss Unit.
3. SSPC: The Society for Protective Coatings.

B. Definitions:

1. Manufacturer: Means the paint manufacturer, unless otherwise indicated.
2. Paint: Means all applied materials, including fillers, primers, emulsions, enamels, varnishes, stains, lacquers, and sealers, whether used as a prime, intermediate, or finish coat.
3. Coating: Means the same as paint.
4. Coat: Means a layer of paint that is applied and then permitted to dry. Both back-rolling and applying wet-on-wet are one coat.
5. Finish: Means an entire coating system, including all surface preparation methods, primers, coats, textures, colors, and sheens.
6. Thickness: Means the total finish DFT, measured in conformance with SSPC paint application standard SSPC-PA2, *"Measurement of Dry Coating Thickness with Magnetic Gages"*.
7. Touchup: Means to correct or repair non-conforming or deficient areas to bring into conformance with the Contract Documents.
8. Refinish: Means to apply a new finish to a previously-finished item or surface.
9. Sheen: Means the following gloss ranges, when tested in conformance with ASTM D 523.

Sheen	Reference Description	Gloss Range	Test Method
Gloss Level 1 (Low Sheen)	Matte/Flat	1 to 5 GUs 1 to 10 GUs	60-degree meter 85-degree meter
Gloss Level 2 (Low Sheen)	Velvet	6 to 10 GUs 11 to 24 GUs	60-degree meter 85-degree meter
Gloss Level 3 (Medium Sheen)	Eggshell	11 to 20 GUs 25 to 35 GUs	60-degree meter 85-degree meter
Gloss Level 4 (Medium Sheen)	Satin	21 to 35 GUs >35 GUs	60-degree meter 85-degree meter
Gloss Level 5 (Medium Sheen)	Low sheen	36 to 49 GUs	60-degree meter
Gloss Level 6 (Medium Sheen)	Semi-gloss	50 to 70 GUs	60-degree meter
Gloss Level 7 (High Sheen)	Gloss	71 to 85 GUs Up to 60 GUs	60-degree meter 20-degree meter
Gloss Level 8 (High Sheen)	High-Gloss	>85 GUs >60 GUs	60-degree meter 20-degree meter

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Unless otherwise indicated, paint all surfaces throughout the Project, except the following.
 - a. Concrete.
 - b. Steel decking.
 - c. Roofing.
 - d. Insulation and its facing.
 - e. Finish hardware, except items specified with a USP finish.
 - f. Prefinished metal surfaces, including anodized aluminum, chrome plating, powder coatings, and similar pre-finished materials.
 - g. Natural finish metal surfaces, including mill finish aluminum, stainless steel, copper, bronze, brass and similar finished materials.
 - h. Walls or ceilings in concealed and inaccessible areas, including furred areas, chases, and shafts.
 - i. Moving, mechanical, or electrical parts of operating units, including valve and damper operator linkages, sensing devices, motor and fan shafts..
 - j. Nameplates and required labels, including UL, FM, and other equipment identification, performance rating, or name plates.

2. Paint all visible surfaces, including surfaces visible through registers, screens and grilles whether or not colors are designated, except where a material's natural finish is obviously intended or explicitly indicated as a surface not painted.
3. Where surfaces are not specifically indicated, paint them to match adjacent similar materials or areas.
4. Specified surface preparation, priming, and paint coats are in addition to surface preparation and shop priming indicated in other specification sections.
5. Coordinate selected paint for compatibility with primers indicated in other specification sections.
 - a. Provide prime coats that are compatible with subsequent coats or provide compatible barrier coats over incompatible primers; or completely remove primer and re-prime.
 - b. Verify chemical and adhesive compatibility of all coats within each paint finish.
6. Coordinate selected paint for compatibility with chemicals used near or on painted surfaces, including cleaning materials, accessories, and methods.
7. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified paint are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
8. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
 - a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead;
 - b. assume the manufacturer-recommended coverage rates govern; and
 - c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.
9. Master Painters Institute standards are insufficient for and not applicable to this project.

B. Sequencing:

1. Schedule paint deliveries to the project site only after the building is enclosed with a permanent enclosure; "wet work" within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Before beginning installation, final light fixtures must be completely installed, energized, and fully illuminated to at least the same type and level of illumination, and color temperature, maintained in the room or space after the building is occupied.
3. Install paint only after penetrating items are installed.
4. After paint installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

C. Scheduling:

1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days and dry before beginning surface preparation and installation.
2. Concrete Masonry Units: CMU walls must be painted within 30 days after building close-in.
3. Cleaning: Schedule cleaning to prevent dust and other contaminants from falling on freshly-applied paint.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Paint Schedule:
 - a. Prepare a list of specified finishes and their project locations, with selected products identified for each coat of every finish.
 - b. Identify substrates to which each specified finish is applied, including surface preparation methods and primers for each substrate.
 3. Samples: Submit 8-1/2-inch by 11-inch drawdown cards of each specified color and sheen. Label each card with project location.
- B. Maintenance Material Submittals:
1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
 2. Furnish one unopened gallon or container for each paint type, color, composition, grade, finish, and variety.
 3. Submit manufacturer-recommended cleaning materials, accessories, and manufacturer's instructions and other requirements and recommendations for maintenance and cleaning of painted surfaces, including a comprehensive list of known chemicals that should not come into contact with painted surfaces.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
1. Paint must be obtained through one source from the same manufacturer (to ensure compatibility and a uniform appearance).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.

2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
2. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of paint is made from field samples.
3. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
4. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

1. Avoid damage to packaging and containers, and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install paint only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
- B. Existing Conditions:
 - 1. Surface Conditions: Surfaces receiving paint must be dry. Install paint only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
 - 2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.
 - 3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same level occurring in the room or space after Final Completion.
- C. Other Conditions: Do not apply paint where dust is generated, or liquids are sprayed; or when windy conditions exist that may cause paint to be blown onto vegetation or other unintended surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Dunn Edwards.
 - 2. Benjamin Moore.
 - 3. Sherwin Williams.

2.2 PAINT

- A. Description: 100-percent premium grade (best grade) low- and no-VOC paints, unless otherwise indicated.
- B. Products: Indicated in the Paint Products Schedule at the end of this specification section.
- C. Requisite Properties:
 - 1. Colors: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule.
 - 2. Sheens: Provide the following, unless otherwise indicated. Verify with Architect.
 - a. Ceilings: Not more than Gloss Level 3. (Eggshell)
 - b. Trim: At least Gloss Level 6. (Gloss)
 - c. Bathroom Walls: At least Gloss Level 5. (Semi-Gloss)

- d. Other Walls: At least Gloss Level 3. (Eggshell)

2.3 ACCESSORIES

- A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 MIXING

- A. Factory-mix paint to match approved samples and mockups accepted by the Architect.
- B. Box paint at the project site or factory-batch to ensure uniform and consistent color. This requirement includes specified maintenance materials.
- C. Open paint containers only as required for use and mix only in designated areas.
- D. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.
- E. Do not reduce, alter, or introduce foreign materials into paint, except in conformance with manufacturer's instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 - 1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with paint adhesion, appearance, or performance.
 - 3. Verify items penetrating paint are installed.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.

2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and paint installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
3. Opening Protection: Close and protect drains and other openings and penetrations to prevent paint intrusion or migration of liquids.

- #### B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install paint using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install paint under conditions that ensure finishes are free from blemishes and defects.
3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Painted surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
4. Do not exceed the application rates recommended by the manufacturer.
5. Completed work must match approved samples and mockups, as accepted by the Architect.
6. Installed paint must be warrantable. Do not install, correct, or replace paint in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Produce uniform finished surfaces without substrates, undercoats, marks, or stains showing through. Produce sharp and even lines and color breaks.
2. Paint surfaces behind movable equipment and furniture the same as adjacent exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint back sides of access panels, removable or hinged covers, and similar hinged items the same as exposed surfaces.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 - 1. written descriptions of non-conforming, damaged, and defective work;
 - 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 - 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
 - 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 - 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 - 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 - 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed paint in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on, adjacent to, or against painted surfaces unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use painted surfaces as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

3.7 SCHEDULE

- A. Paint products schedule begins on the next page.

END OF SECTION

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SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
EXTERIOR SURFACES - LOW VOC				
Concrete & CMU Substrates: As specified in Section 09 96 13 - Elastomeric Coatings				
Concrete & Brick Substrates: 100% Acrylic FLAT				
	1 st Coat	023 Fresh Start Primer	ESPR00 Eff-Stop	A24W8300 Loxon
	2 nd Coat	400 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
	3 rd Coat	400 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
CMU Substrates: 100% Acrylic FLAT				
	1 st Coat	M88 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	400 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
	3 rd Coat	400 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
CMU Substrates: 100% Acrylic ELASTOMERIC				
	1 st Coat	023 Fresh Start Primer	ESPR00 Eff-Stop	A24W8300 Loxon
	2 nd Coat	056 Moorlastic	W370 Endurawall	CF16 Conflex SherLastic
	3 rd Coat	056 Moorlastic	W370 Endurawall	CF16 Conflex SherLastic
Finished Wood Surfaces: 100% Acrylic FLAT				
	1 st Coat	0046 Hi-Hide All Purpose Primer	EZPR00 EZ Prime Premium	B42W8041 Exterior Wood Primer
	2 nd Coat	W105 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
	3 rd Coat	W105 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
Finished Wood Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	0046 Hi-Hide All Purpose Primer	EZPR00 EZ Prime Premium	B42W8041 Exterior Wood Primer
	2 nd Coat	W096Regal Soft Gloss	EVSH50 Evershield Semi Gloss	A76 Solo Semi Gloss
	3 rd Coat	W096Regal Soft Gloss	EVSH50 Evershield Semi Gloss	A76 Solo Semi Gloss

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Finished Wood Surfaces: 100% Acrylic GLOSS				
	1 st Coat	0046 Hi-Hide All Purpose Primer	EZPR00 EZ Prime Premium	B42W8041 Exterior Wood Primer
	2 nd Coat	NA	EVSH60 Evershield Gloss	K34 Duration Gloss
	3 rd Coat	NA	EVSH60 Evershield Gloss	K34 Duration Gloss
Finished Wood Surfaces: Semi-Transparent Stain				
	1 st Coat	0638 Arborcoat S/T Stain	Okon WPT-3	A15T5 Woodscapes ST Stain
	2 nd Coat	0638 Arborcoat S/T Stain	Okon WPT-3	A15T5 Woodscapes ST Stain
Iron, Steel, and Galvanized Steel Surfaces: Specified in Section 09 97 13 - High Performance Steel Coatings				
Iron & Steel Substrates: 100% Acrylic GLOSS				
	1 st Coat	M04 Acrylic Metal Primer	BRPR00-1 Block Rust	B66-310 Pro-Cryl Primer
	2 nd Coat	N/A	EVSH60 Evershield Gloss	K34 Duration Gloss
	3 rd Coat	N/A	EVSH60 Evershield Gloss	K34 Duration Gloss
Iron & Steel Substrates: 100% Acrylic SEMI-GLOSS				
	1 st Coat	M04 Acrylic Metal Primer	BRPR00-1 Block Rust	B66-310 Pro-Cryl Primer
	2 nd Coat	402 Regal Soft Gloss	EVSH50 Evershield Semi Gloss	B42 Metalatex SG
	3 rd Coat	402 Regal Soft Gloss	EVSH50 Evershield Semi Gloss	B42 Metalatex SG
Galvanized Steel & Aluminum Substrates: 100% Acrylic GLOSS				
Aluminum Surfaces: 100% Acrylic GLOSS				
	Pretreatment	Jasco Prep N Prime	ME01 Etch	B71Y1 DTM Wash Primer
	1 st Coat	P04 Acrylic Metal Primer	GAPR00 Galv-Alum Premium	B66-310 Pro-Cryl Primer
	2 nd Coat	N/A	EVSH60 Evershield Gloss	K34 Duration Gloss
	3 rd Coat	N/A	EVSH60 Evershield Gloss	K34 Duration Gloss

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
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Galvanized Steel & Aluminum Substrates: 100% Acrylic SEMI-GLOSS

Aluminum Surfaces: 100% Acrylic SEMI-GLOSS

Pretreatment	Jasco Prep N Prime	ME01 Etch	B71Y1 DTM Wash Primer
1 st Coat	P04 Acrylic Metal Primer	GAPR00 Galv-Alum Premium	B66-310 Pro-Cryl Primer
2 nd Coat	W096 Regal Soft Gloss	EVSH50 Evershield Semi Gloss	A76 Solo Semi Gloss
3 rd Coat	W096 Regal Soft Gloss	EVSH50 Evershield Semi Gloss	A76 Solo Semi Gloss

Zinc Alloy Surfaces: 100% Acrylic SEMI-GLOSS

Pretreatment	Jasco Prep N Prime	ME01 Etch	B71Y1 DTM Wash Primer
1 st Coat	P04 Acrylic Metal Primer	GAPR00 Galv-Alum Premium	B66-310 Pro-Cryl Primer
2 nd Coat	W096 Regal Soft Gloss	EVSH50 Evershield Semi Gloss	A76 Solo Semi Gloss
3 rd Coat	W096 Regal Soft Gloss	EVSH50 Evershield Semi Gloss	A76 Solo Semi Gloss

Fiber Cement Board Surfaces: 100% Acrylic FLAT

1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop	A24W8300 Loxon
2 nd Coat	W105 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
3 rd Coat	W105 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat

Portland Cement Plaster (Stucco) Surfaces (Does not apply to Polymer-Modified Plaster Surfaces): Specified in Section 09 96 13 - Elastomeric Coatings

Portland Cement Plaster (Stucco) Substrates (Does not apply to Polymer-Modified Plaster Surfaces): 100% Acrylic FLAT

1 st Coat	023 Fresh Start Primer	ESPR00 Eff-Stop	A24W8300 Loxon
2 nd Coat	400 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
3 rd Coat	400 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Gypsum Soffit Board Surfaces: 100% Acrylic FLAT				
	1 st Coat	N023 Fresh Start Primer	Inter-Kote Premium IKPR00	B51-600 PrepRite ProBlock
	2 nd Coat	W105 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
	3 rd Coat	W105 Regal Select Flat	EVSH10 Evershield Flat	K32 Duration Flat
INTERIOR SURFACES - LOW VOC				
Concrete Surfaces: 100% Acrylic FLAT				
	1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop	A24W8300 Loxon
	2 nd Coat	547 Regal Select Flat	SSHL10 Spartashield Flat	A74 Solo Flat
	3 rd Coat	547 Regal Select Flat	SSHL10 Spartashield Flat	A74 Solo Flat
Concrete Surfaces: 100% Acrylic EGG SHELL				
	1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop Premium	A24W8300 Loxon
	2 nd Coat	550 Regal Select Pearl	SSHL30 Spartashield Eggshell	A75 Solo Eg-Shel
	3 rd Coat	550 Regal Select Pearl	SSHL30 Spartashield Eggshell	A75 Solo Eg-Shel
Concrete Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop Premium	A24W8300 Loxon
	2 nd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
	3 rd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
Concrete Surfaces: 100% Acrylic GLOSS				
	1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop Premium	A24W8300 Loxon
	2 nd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
	3 rd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
Concrete Surfaces: 100% Epoxy GLOSS				
	1 st Coat	N023 Fresh Start Primer	Rust Oleum Sierra S70/S71 WB	A24W8300 Loxon
	2 nd Coat	P43 Super Spec HP Gloss Epoxy	Rust-Oleum Sierra S60 Gloss WB Epoxy	B73-300 ProIndustrial Waterbased Epoxy Gloss

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
CMU Surfaces: 100% Acrylic Flat				
	1 st Coat	160 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	547 Regal Select Flat	SSHL10 Spartashield Flat	A74 Solo Flat
	3 rd Coat	547 Regal Select Flat	SSHL10 Spartashield Flat	A74 Solo Flat
CMU Surfaces: 100% Acrylic EGG SHELL				
	1 st Coat	160 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	550 Regal Select Pearl	SSHL30 Spartashield Eggshell	A75 Solo Eg-Shel
	3 rd Coat	550 Regal Select Pearl	SSHL30 Spartashield Eggshell	A75 Solo Eg-Shel
CMU Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	160 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
	3 rd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
CMU Surfaces: 100% Acrylic GLOSS				
	1 st Coat	160 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
	3 rd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
CMU Surfaces: 100% Epoxy GLOSS				
	1 st Coat	160 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	P43 Super Spec HP Gloss Epoxy	Rust-Oleum Sierra S60 Gloss WB Epoxy	B73-300 ProIndustrial Waterbased Epoxy Gloss
Ferrous Metal Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	BRPR00 Bloc-Rust	B66-310 Pro-Cryl Primer
	2 nd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
	3 rd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
Ferrous Metal Surfaces: 100% Acrylic GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	UGPR00 Ultra-Grip	B66-310 Pro-Cryl Primer
	2 nd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
	3 rd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Aluminum Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	BRPR00 Bloc-Rust	B66-310 Pro-Cryl Primer
	2 nd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
	3 rd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
Aluminum Surfaces: 100% Acrylic GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	UGPR00 Ultra-Grip	B66-310 Pro-Cryl Primer
	2 nd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
	3 rd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
Stainless Steel, Copper, and Brass Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	BRPR00 Bloc-Rust	B66-310 Pro-Cryl Primer
	2 nd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
	3 rd Coat	551 Regal Select Semi Gloss	SSHL50 Spartashield Semi-Gloss	A76 Solo Semi-Gloss
Stainless Steel, Copper, and Brass Surfaces: 100% Acrylic GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	UGPR00 Ultra-Grip	B66-310 Pro-Cryl Primer
	2 nd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
	3 rd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
Rough Sawn Wood Surfaces: Semi-Transparent Stain				
	1 st Coat	0638 Arborcoat S/T Stain	Okon WPT-3	Sherwood BAC ST Stain
	2 nd Coat	0638 Arborcoat S/T Stain	Okon WPT-3	Sherwood BAC ST Stain
Finished Wood Surfaces: Semi-Transparent Stain				
	1 st Coat	Moore's S/T WB Stain	Old Masters Wood Stain	Sherwood BAC ST Stain
Finished Wood Surfaces: Clear Lacquer Finish				
	1 st Coat	NRS 1620 Sanding Sealer	LQX 101-0 Sanding Sealer	Trinity TLS 2153 Sanding Sealer
	2 nd Coat	NRF 1626 Satin Lacquer	LQX 104-0 Satin Lacquer	Trinity TLC 2420N Satin Lacquer
	3 rd Coat	NRF 1626 Satin Lacquer	LQX 103-0 Satin Lacquer	Trinity TLC 2420N Satin Lacquer

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Finished Wood Surfaces: Water White Finish (for light-colored stains)				
	1 st Coat	NAF 1420 Satin Sealer	LQX 131-0 Sanding Sealer	Trinity TLS 2138 Sanding Sealer
	2 nd Coat	NAF 1426 Satin Lacquer	LQX 132-0 Satin Lacquer	Trinity TLC 2310N Satin Lacquer
	3 rd Coat	NAF 1426 Satin Lacquer	LQX 132-0 Satin Lacquer	Trinity TLC 2310N Satin Lacquer
Finished Wood Surfaces: Clear Varnish Finish FLAT				
	1 st Coat	Zenith PKF7501 Flat	Zenith PKF7501 Flat	Zenith PKF7501 Flat
	2 nd Coat	Zenith PKF7501 Flat	Zenith PKF7501 Flat	Zenith PKF7501 Flat
	3 rd Coat	Zenith PKF7501 Flat	Zenith PKF7501 Flat	Zenith PKF7501 Flat
Finished Wood Surfaces: Clear Varnish Finish SEMI-GLOSS				
	1 st Coat	Zenith PKF7502 Satin	Zenith PKF7502 Satin	A68 Wood Classics WB Satin
	2 nd Coat	Zenith PKF7502 Satin	Zenith PKF7502 Satin	A68 Wood Classics WB Satin
	3 rd Coat	Zenith PKF7502 Satin	Zenith PKF7502 Satin	A68 Wood Classics WB Satin
Finished Wood Surfaces: Clear Varnish Finish GLOSS				
	1 st Coat	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss	A68 Wood Classics WB Gloss
	2 nd Coat	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss	A68 Wood Classics WB Gloss
	3 rd Coat	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss	A68 Wood Classics WB Gloss
Finished Wood Surfaces: 100% Acrylic LOW SHEEN				
	1 st Coat	0046 Hi-Hide All Purpose Primer	UGPR00 Ultra-Grip	B51 PrepRite Pro Block Primer
	2 nd Coat	549 Regal Select Eggshell	SPMA20 Suprema VS	A75 Solo Eg-Shel
	3 rd Coat	549 Regal Select Eggshell	SPMA20 Suprema VS	A75 Solo Eg-Shel
Finished Wood Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	0046 Hi-Hide All Purpose Primer	UGPR00 Ultra-Grip	B51 PrepRite Pro Block Primer
	2 nd Coat	551 Regal Select Semi Gloss	SPMA50 Suprema Semi Gloss	A76 Solo Semi-Gloss
	3 rd Coat	551 Regal Select Semi Gloss	SPMA50 Suprema Semi Gloss	A76 Solo Semi-Gloss
Finished Wood Surfaces: 100% Acrylic Dryfall FLAT				
	1 st Coat	M53 Dryfall Flat	W 6079 Aquafall Flat	B42 Low VOC Dryfall Flat
	2 nd Coat	M53 Dryfall Flat	W 6079 Aquafall Flat	B42 Low VOC Dryfall Flat

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Particle Board, MDF, and Hardboard Surfaces: 100% Acrylic FLAT				
	1 st Coat	N023 Fresh Start Primer	UGPR00 Ultra-Grip	B28W08111 Premium Primer
	2 nd Coat	547 Regal Select Flat	SPMA10 Suprema Flat	A74 Solo Flat
	3 rd Coat	547 Regal Select Flat	SPMA10 Suprema Flat	A74 Solo Flat
Particle Board, MDF, and Hardboard Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	N023 Fresh Start Primer	UGPR00 Ultra-Grip	B28W08111 Premium Primer
	2 nd Coat	551 Regal Select Semi Gloss	SPMA50 Suprema Semi Gloss	A76 Solo Semi-Gloss
	3 rd Coat	551 Regal Select Semi Gloss	SPMA50 Suprema Semi Gloss	A76 Solo Semi-Gloss
Particle Board, MDF, and Hardboard Surfaces: 100% Acrylic GLOSS				
	1 st Coat	N023 Fresh Start Primer	UGPR00 Ultra-Grip	B28W08111 Premium Primer
	2 nd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
	3 rd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
Portland Cement Plaster Surfaces: 100% Acrylic FLAT				
	1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop Premium	A24W8300 Loxon
	2 nd Coat	547 Regal Select Flat	SPMA10 Suprema Flat	A74 Solo Flat
	3 rd Coat	547 Regal Select Flat	SPMA10 Suprema Flat	A74 Solo Flat
Portland Cement Plaster Surfaces: 100% Acrylic EGGSHELL				
	1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop Premium	A24W8300 Loxon
	2 nd Coat	550 Regal Select Pearl	SPMA30 Suprema LS	A75 Solo Eg-Shel
	3 rd Coat	550 Regal Select Pearl	SPMA30 Suprema LS	A75 Solo Eg-Shel

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Portland Cement Plaster Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop Premium	A24W8300 Loxon
	2 nd Coat	551 Regal Select Semi Gloss	SPMA50 Suprema Semi Gloss	A76 Solo Semi-Gloss
	3 rd Coat	551 Regal Select Semi Gloss	SPMA50 Suprema Semi Gloss	A76 Solo Semi-Gloss
Portland Cement Plaster Surfaces: 100% Acrylic GLOSS				
	1 st Coat	N023 Fresh Start Primer	ESPR00 Eff-Stop Premium	A24W8300 Loxon
	2 nd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
	3 rd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
Portland Cement Plaster Surfaces: 100% Epoxy GLOSS				
	1 st Coat	N023 Fresh Start Primer	Rust-Oleum S70/S71 WB	A24W8300 Loxon
	2 nd Coat	P43 Super Spec HP Gloss Epoxy	Rust-Oleum Sierra S60 Gloss WB Epoxy	B73-300 ProIndustrial Waterbased Epoxy Gloss
Gypsum Board Surfaces: 100% Acrylic FLAT				
	1 st Coat	NA	VNPR00 Vinylastic Premium	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	547 Regal Select Flat	SPMA10 Suprema Flat	B5-1000 Harmony Flat
	3 rd Coat	547 Regal Select Flat	SPMA10 Suprema Flat	B5-1000 Harmony Flat
Gypsum Board Surfaces: 100% Acrylic LOW SHEEN				
	1 st Coat	N023 Fresh Start Primer	VNPR00 Vinylastic Premium	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	549 Regal Select Eggshell	SPMA20 Suprema VS	B41-1900 ProMar 200 Zero VOC HP Low Gloss EgShel
	3 rd Coat	549 Regal Select Eggshell	SPMA20 Suprema VS	B41-1900 ProMar 200 Zero VOC HP Low Gloss EgShel
Gypsum Board Surfaces: 100% Acrylic EGGSHELL				
	1 st Coat	N023 Fresh Start Primer	VNPR00 Vinylastic Premium	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	550 Regal Select Pearl	SPMA30 Suprema LS	B20-1900 ProMar 200 Zero VOC HP EgShel
	3 rd Coat	550 Regal Select Pearl	SPMA30 Suprema LS	B20-1900 ProMar 200 Zero VOC HP EgShel

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
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Gypsum Board Surfaces: 100% Acrylic SEMI-GLOSS

1 st Coat	N023 Fresh Start Primer	VNPR00 Vinylastic Premium	B28W2600 ProMar 200 Zero VOC Primer
2 nd Coat	551 Regal Select Semi Gloss	SPMA50 Suprema Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
3 rd Coat	551 Regal Select Semi Gloss	SPMA50 Suprema Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss

Gypsum Board Surfaces: 100% Acrylic GLOSS

1 st Coat	N023 Fresh Start Primer	VNPR00 Vinylastic Premium	B28W2600 ProMar 200 Zero VOC Primer
2 nd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss
3 rd Coat	794 Advance High Gloss	EVSH 60 Evershield Gloss	A77 Solo Gloss

Gypsum Board Surfaces: 100% Epoxy GLOSS

1 st Coat	N/A	Rust-Oleum Sierra S70/S71 WB Epoxy Acrylic Primer	B28W2600 ProMar 200 Zero VOC Primer
2 nd Coat	N/A	Rust-Oleum Sierra S60 Gloss WB Epoxy	B73-300 ProIndustrial Waterbased Epoxy Gloss

Acoustical Tile Surfaces: 100% Acrylic FLAT

1 st Coat	258 Moore's Ceiling White	W 615 Acoustikote	B5-1000 Harmony Flat
2 nd Coat	258 Moore's Ceiling White	W 615 Acoustikote	B5-1000 Harmony Flat

INTERIOR SURFACES - ZERO VOC

Concrete Surfaces: Acrylic FLAT

1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
2 nd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
3 rd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Concrete Surfaces: 100% Acrylic EGGSHELL				
	1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
	3 rd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
Concrete Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
CMU Surfaces: Acrylic FLAT				
	1 st Coat	160 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
	3 rd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
CMU Surfaces: 100% Acrylic EGGSHELL				
	1 st Coat	160 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
	3 rd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
CMU Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	160 Latex Block Filler	SBPR00 Blockfill	B25W25 Block Filler
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Iron & Steel Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	UGPR00 Ultra-Grip	B66-310 Pro-Cryl Primer
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
Aluminum Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	UGPR00 Ultra-Grip	B66-310 Pro-Cryl Primer
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
Stainless Steel, Copper, and Brass Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	P04 Acrylic Metal Primer	UGPR00 Ultra-Grip	B66-310 Pro-Cryl Primer
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
Finished Wood Surfaces: 100% Acrylic EGGSHELL				
	1 st Coat	511 Natura Primer	UGPR00 Ultra-Grip	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
	3 rd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
Finished Wood Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	511 Natura Primer	UGPR00 Ultra-Grip	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Particle Board, MDF, and Hardboard Surfaces: Acrylic FLAT				
	1 st Coat	511 Natura Primer	UGPR00 Ultra-Grip	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
	3 rd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
Particle Board, MDF, and Hardboard Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	511 Natura Primer	UGPR00 Ultra-Grip	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
Portland Cement Plaster Surfaces: Acrylic FLAT				
	1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
	3 rd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
Portland Cement Plaster Surfaces: 100% Acrylic EGGSHELL				
	1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
	3 rd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
Portland Cement Plaster Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss

SUBSTRATE	NO. OF COATS	BENJAMIN MOORE	DUNN-EDWARDS	SHERWIN WILLIAMS
Gypsum Board Surfaces: Acrylic FLAT				
	1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
	3 rd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
Gypsum Board Surfaces: 100% Acrylic EGGSHELL				
	1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
	3 rd Coat	513 Natura Eggshell	EVER 30 Everest Eggshell	B20-1900 ProMar 200 Zero VOC HP EgShel
Gypsum Board Surfaces: 100% Acrylic SEMI-GLOSS				
	1 st Coat	511 Natura Primer	VNSL00 Vinylastic Select Primer	B28W2600 ProMar 200 Zero VOC Primer
	2 nd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
	3 rd Coat	514 Natura Semi Gloss	EVER 50 Everest Semi Gloss	B31-1900 ProMar 200 Zero VOC HP Semi-Gloss
Acoustical Tile Surfaces: Acrylic FLAT				
	1 st Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat
	2 nd Coat	512 Natura Flat	EVER 10 Everest Flat	B5-1000 Harmony Flat

SECTION 09 96 56 – EPOXY COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Epoxy coatings.
 2. Surface preparation.
 3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

- A. Abbreviations and Acronyms:
1. ICRI: International Concrete Repair Institute, Inc.
- B. Definitions:
1. Manufacturer: Means the epoxy coating manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Verify chemical and adhesive compatibility of selected floor coatings with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.
 2. Coordinate selected coating for compatibility with chemicals used near or on coated surfaces, including cleaning materials, accessories, and methods.
 3. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified epoxy coatings are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
 4. Coordinate existing concrete subfloor surface flatness and levelness with ACI 117 requirements, measured in conformance with ASTM E 1155 (3D laser scanning or Allen Face F-Meter methods), and tolerances required, recommended, or accepted by the flooring manufacturer.
 5. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
 - a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead;
 - b. assume the manufacturer-recommended coverage rates govern; and

- c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.

B. Sequencing:

1. Install epoxy floor coatings only after substrate is cured to a condition of equilibrium; is sufficiently dry to bond with epoxy coatings; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible surface treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
2. Substrate repairs must be completed after surface preparation.
3. Final light fixtures must be completely installed and energized before beginning installation.
4. Install floor coatings only after penetrating items are installed.

C. Scheduling:

1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
2. Primer Installation: Floor coatings must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
3. Access Restrictions: Close spaces during installation; keep closed to foot traffic after installation for at least 48 hours and to rolling load traffic for at least 72 hours.
4. Cleaning: Schedule cleaning to prevent dust and other contaminants from falling on freshly applied coatings.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Samples: Submit 8-1/2-inch by 11-inch drawdown cards of each specified color and sheen. Label each card with project location.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished epoxy coatings.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.

- b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
- C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
 1. Maintenance Data: Submit copies of manufacturer's instructions and other requirements and recommendations for coating maintenance, cleaning, and repair.
- D. Maintenance Material Submittals:
 1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
 2. Furnish one unopened gallon or container for each epoxy coating type, color, composition, grade, finish, and variety.
 3. Submit manufacturer-recommended cleaning materials, accessories, and manufacturer's instructions and other requirements and recommendations for maintenance and cleaning of coated surfaces, including a comprehensive list of known chemicals that should not come into contact with coated surfaces.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 1. Epoxy coatings must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- A. Regulatory Requirements:
 1. Radiant Flux Classification: Provide floor coating having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.
 2. Allowable Static Coefficient of Friction Value for Flooring Surfaces (SCOF): At least 0.6 for level surfaces and at least 0.8 for sloped surfaces, when measured in conformance with ASTM D 2047.
 3. Allowable Dynamic Coefficient of Friction Value for Hard Surface Flooring (DCOF): Between 0.35 and 0.45, with at least 0.42 minimum "passing" value, when measured in conformance with ANSI 326.3 under wet conditions.
- B. Qualifications:

1. Installer: Company or individuals must have at least 5 years' experience installing epoxy coatings for at least 30 previous projects similar to this project in size, material, design, and complexity.
 2. Supervisors: Individuals must have at least 7 years' experience installing epoxy coatings for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading epoxy coating installers.
- C. Field Samples: Include *in-situ* mockups as part of the work of this specification section.
1. Install at least one 100-square-foot field sample of each epoxy coating installation to verify selections made under sample submittal and to set quality standards for installation. Demonstrate surface preparation, crack repair, and joint and corner preparation.
 2. Test epoxy coating adhesion to verify surface preparation.
 3. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
 4. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of floor coatings is made from field samples.
 5. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
 6. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
1. Furnish adequate dunnage and bracing during storage.
 2. Prevent stored items from contacting the floor and from deterioration and damage.
 3. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
 4. Incline covered items to ensure maximum drainage of accumulated moisture.
 5. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or

other sources of deterioration and damage, including dust and other airborne contaminants.

- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
 - 1. Avoid damage to packaging and containers, and contamination of contents.
 - 2. Rotate inventory; do not use items the shelf life of which is expired.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective epoxy coatings with undamaged new epoxy coatings that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install epoxy coatings only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
- B. Existing Conditions:
 - 1. Surface Conditions: Surfaces receiving epoxy coatings must be dry. Install epoxy coatings only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
 - 2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.
 - 3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.
- C. Other Conditions: Do not apply epoxy coatings where dust is generated, or liquids are sprayed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Crossfield Products Corp.
 - 2. Dur-A-Flex, Inc.
 - 3. Stonhard.
 - 4. Tnemec Co.

2.2 EPOXY COATINGS

- A. Description: High-solids moisture tolerant epoxy/ceramic-modified waterborne aliphatic polyurethane coatings.
- B. Application: Applied to horizontal and vertical surfaces.
- C. Base Coat: Provide the following manufactured by the Tnemec Co., or equal.
 - 1. Concrete Primer: "Series 201 Epoxoprime", or equal, moisture tolerant epoxy applied to a DFT between 6 and 8 mils.
 - 2. CMU Block Filler: "Series 130 Envirofill", or equal, waterborne cementitious acrylic applied to a DFT between 2 to 3 mils.
 - 3. Drywall Primer: "Series 287 Enviro-Pox", or equal, waterborne epoxy-amine adduct applied to a DFT between 2 to 3 mils.
- D. Intermediate Coat: "Series 287 Enviro-Pox" manufactured by the Tnemec Co., or equal, waterborne epoxy-amine adduct applied to a DFT between 2 to 3 mils.
- E. Top Coat: "Series 297 EnviroGlaze" manufactured by the Tnemec Co., or equal, 2-component, water-based urethane coating applied to a DFT between 2 to 3 mils.
- F. Requisite Properties:
 - 1. Concrete and CMU Total Systems Total Thickness: 10- and 15 mils DFT.
 - 2. Drywall System Total Thickness: Between 6- and 9 mils DFT.
 - 3. Color: Selected by the Architect.

2.3 SURFACE PREPARATION

- A. Substrate Testing and Surface Preparation: Perform testing and corrective work, and prepare substrates in conformance with the requirements of Section 09 05 16.
- B. Concrete Surface Profiling: Provide ICRI concrete surface profile CSP 3 to CSP 5 (between 10 and 40 mils), unless otherwise explicitly required, recommended, or accepted in writing by the coating manufacturer. Conform to the requirements of Section 09 05 16.

2.4 ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: As specified in Section 03 54 16, or as otherwise supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- B. Moisture Vapor Transmission-Resistant Grout: Polymer modified cementitious osmotic-pressure-resistant grout supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

- C. Slip-Resistive Additive: Provide glass beads supplied, required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
- D. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MIXING

- A. Open epoxy coating containers only as required for use and mix only in designated areas.
- B. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.
- C. Do not reduce, alter, or introduce foreign materials into epoxy coatings, except in conformance with manufacturer's instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 - 1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with epoxy coating adhesion, appearance, or performance.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

- A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and epoxy coating installation.
 2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
 3. Opening Protection: Close and protect drains and other openings and penetrations to prevent epoxy coating intrusion or migration of liquids.
- B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

- A. General Requirements:
1. Install epoxy coatings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 2. Only install epoxy coatings under conditions that ensure finishes are free from blemishes and defects.
 3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. epoxy coating surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
 4. Do not exceed the application rates recommended by the manufacturer.
 5. Installed epoxy coatings must be warrantable. Do not install, correct, or replace epoxy coatings in a manner that results in any warranty or guarantee becoming void.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
 - 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 - 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 - 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 - 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect epoxy coatings in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on, adjacent to, or against epoxy coatings unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed epoxy coatings as work surfaces.

END OF SECTION

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SECTION 09 97 23 – PENETRATING CONCRETE FLOOR SEALER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrating concrete floor sealer.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the concrete sealer manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify chemical and adhesive compatibility of selected concrete sealer with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.
2. Coordinate selected sealer for compatibility with chemicals used near or on coated surfaces, including cleaning materials, accessories, and methods.
3. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified concrete sealers are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
4. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
 - a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead;
 - b. assume the manufacturer-recommended coverage rates govern; and
 - c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.

B. Sequencing:

1. Install concrete sealers only after concrete is cured to a condition of equilibrium; is sufficiently dry to bond with concrete sealers; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer.
2. Either delay concrete sealer installation until after joint sealant installation is complete, or protect sealant bond surfaces to prevent concrete sealer migration onto

joint surfaces. concrete sealer application may only precede sealant application after sealant adhesion and compatibility are tested and verified using substrates, concrete sealers, and sealant materials identical to those used in the work.

- C. Scheduling: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
 - 1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 - 1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished concrete sealers.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
 - 2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
- C. Maintenance Material Submittals:
 - 1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
 - 2. Furnish one unopened gallon or container for each concrete sealer type, color, composition, grade, finish, and variety.
 - 3. Submit manufacturer-recommended cleaning materials, accessories, and manufacturer's instructions and other requirements and recommendations for maintenance and cleaning of sealed surfaces, including a comprehensive list of known chemicals that should not come into contact with sealed surfaces.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer: Company or individuals must have at least 5 years' experience installing concrete sealers for at least 30 previous projects similar to this project in size, material, design, and complexity.

2. Supervisors: Individuals must have at least 7 years' experience installing concrete sealers for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading concrete sealer installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
 1. Furnish adequate dunnage and bracing during storage.
 2. Prevent stored items from contacting the floor and from deterioration and damage.
 3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
 1. Avoid damage to packaging and containers, and contamination of contents.
 2. Rotate inventory; do not use items the shelf life of which is expired.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective concrete sealers with undamaged new concrete sealers that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

- A. Ambient Conditions: Install concrete sealers only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
 1. Do not install concrete sealers during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
 2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.

3. Do not apply concrete sealers when
 - a. ambient temperature is below 45 deg. F or more than 90 deg. F during application, and for at least 8 hours after;
 - b. surface temperatures are less than 40 deg. F or greater than 120 deg. F; and
 - c. surface temperatures are 5 deg. F or less above the dew point.
- B. Existing Conditions:
 1. Surface Conditions: Surfaces receiving concrete sealers must be dry. Install concrete sealers only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
 2. Other Conditions: Do not apply concrete sealers where dust is generated, or liquids are sprayed; or when windy conditions exist that may cause concrete sealers to be blown onto vegetation or other unintended surfaces.

PART 2 - PRODUCTS

2.1 PENETRATING CONCRETE FLOOR SEALER

- A. Description: Clear-drying, water-based silane or siloxane water repellent sealer for interior exposed concrete slabs.
- B. Product: "Sure Klean Weather Seal Siloxane WB Concentrate" manufactured by PROSOCO, Inc., or equal.
 1. Porous Surfaces (e.g., Concrete Brick, Concrete Pavers, and Concrete Tile): Dilute to 1 part concentrate to not more than 7 parts water.
 2. Semi-Porous Surfaces (e.g., Cast-in-Place Concrete, Precast Concrete, Clay Brick, Terra Cotta, and Unpolished Sandstone): Dilute to 1 part concentrate to not more than 9 parts water.
 3. Dense Surfaces: Dilute to 1 part concentrate to not more than 14 parts water.
- C. Requisite Properties: When compared visually to an untreated sample under the same lighting conditions, concrete sealers may not alter the color or sheen of the coated substrate and must be invisible after application and over the life of the substrate. Confirm visual appearance by mockups and adjust products and applications as required.

2.2 ACCESSORIES

- A. Mix Water: Provide fresh, clean, clear, potable water from a domestic source. Water must conform to ASTM C 1602 and be free of oil, grease, waxy films, curing compounds, release agents, and other deleterious materials, including salts, acids, alkalis, organic materials, detergents, and other matter that might negatively affect tile quality, durability, or performance.

- B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.3 MIXING

- A. Open concrete sealer containers only as required for use and mix only in designated areas.
- B. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.
- C. Do not reduce, alter, or introduce foreign materials into concrete sealers, except in conformance with manufacturer's instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification:
 - 1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with concrete sealer adhesion, appearance, or performance.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

- A. Protection:
 - 1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and concrete sealer installation.

2. **Adjacent Material Protection:** Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
 3. **Opening Protection:** Close and protect drains and other openings and penetrations to prevent concrete sealer intrusion or migration of liquids.
- B. **Substrate Preparation:** Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. **General Requirements:**

1. Install concrete sealers using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install concrete sealers under conditions that ensure finishes are free from blemishes and defects.
3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. concrete sealer surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
4. Do not exceed the application rates recommended by the manufacturer.
5. Installed concrete sealers must be warrantable. Do not install, correct, or replace concrete sealers in a manner that results in any warranty or guarantee becoming void.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
 - 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 - 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 - 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 - 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect sealed concrete in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on, adjacent to, or against sealed concrete unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed sealed concrete surfaces as work surfaces.

END OF SECTION

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DIVISION 10

SPECIALTIES

SECTION 10 14 13 – REGULATORY SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Restroom doors signs.
 2. Egress stairway door signs.
 3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

- A. Definitions:
1. Manufacturer: Means the sign material manufacturer, unless otherwise indicated.
 2. Fabricator: Means the sign fabricator, unless otherwise indicated.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
 3. Samples: Submit at least 8-inch square representative samples of each sign color, finish, and variety.
- B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Submit manufacturer-prepared published instructions for proper installation of furnished signs.
 2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.

3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Signs must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

A. Regulatory Requirements:

1. Chemical Signs and Labels: Provide Proposition 65 signage in conformance with International Code of Regulations.
2. Raised Characters: Raised characters must conform to the requirements of International Building Code:
3. Depth: It must be 1/32-inch (0.8 mm) minimum above their background and must be sans serif uppercase and be duplicated in Braille.
4. Height: It must be 5/8-inch (15.9 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter "I". International Building Code
5. Finish and Contrast: Characters and their background must have a non-glare finish. Character must contrast with their background with either light characters on a dark background or dark characters on a light background. International Building Code.
6. Proportions: It must be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" must be 15 percent maximum of the height of the character. International Building Code.
7. Character Spacing: Spacing between individual raised characters must conform to the requirements of International Building Code.
8. Format: Text must be in a horizontal format. International Building Code.
9. Braille: It must be contracted (Grade 2) and must conform to the requirements of International Building Code. Braille dots must have a domed or rounded shape and must conform to the requirements of International Building Code.
10. Mounting Height: Tactile characters on signs must be located 48 inches minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. International Building Code.
11. Mounting Location: A tactile sign must be located per International Building Code as follows:

- a. alongside a single door at the latch side.
 - b. on the inactive leaf at double doors with one active leaf.
 - c. to the right of the right hand door at double doors with two active leaves.
 - d. on the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leaves.
 - e. so that a clear floor space of 18 inches by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.
12. Visual characters must conform to the requirements of International Building Code and must be 40 inches minimum above finish floor or ground.
 13. Pictograms must conform to the requirements of International Building Code.
 14. Symbols of accessibility must conform to the requirements of International Building Code.
 15. Variable message signs must conform to the requirements of International Building Code.

1.5 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective signs with undamaged new signs that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 PHOTOPOLYMER PANEL SIGNS

- A. Description: Single-piece photopolymer panel permanent identification signs consisting of moisture resistant non-glare photopolymer bonded to sign base material.

- B. Manufacturer: Provide photopolymer products manufactured by Nova Polymers, Inc., or equal.
- C. Fabricators: Provide signs fabricated by one of the following, or equal.
 - 1. Neiman & Co.
 - 2. Signtech Inc.
- D. Materials:
 - 1. Photopolymer Layer: 0.040-inch acrylic photopolymer.
 - 2. Base Material:
 - a. Interior Locations: 0.120-inch phenolic base.
 - b. Exterior Locations: Exterior grade photopolymer applied to a 0.120-inch phenolic base.
- E. Requisite Properties:
 - 1. Overall Panel Thickness: Between 1/8- and 1/4-inch.
 - 2. Colors: Indicated on the Drawings or selected by the Architect.
 - 3. Finish: Furnish non-glare finish.
 - 4. Edge Condition: Square cut.
 - 5. Corner Condition: Square.
 - 6. Mounting: Indicated on the Drawings.
 - 7. Copy: Indicated on the Drawings or selected by the Architect.
 - a. Letter spacing must conform to standards shown and kerned optically to the acceptance of the Architect.
 - b. Lines of copy must be straight and parallel to the sign format, unless otherwise indicated.
 - c. Edges of letters, numbers, and symbols must be smooth and continuous, with straight and curved portions reproducing the original forms exactly, with corners sharp and true.
 - d. All forms must be free from ticks, line waiver, discontinuous curves, and other imperfections.
 - 8. Font: Indicated on the Drawings or selected by the Architect.

2.2 INSTALLATION MATERIALS

- A. Fasteners: Non-removable mechanical fasteners and anchors suitable for secure attachment to substrate and placed through predrilled holes as recommended in writing by the sign manufacturer.
 - 1. Exposed Fasteners: Exposed fasteners are permitted only where specifically stated in the drawings and must be stainless steel painted or finished to match adjacent surfaces, unless otherwise indicated.
 - 2. Concealed Fasteners: Fabricate from metals that are not corrosive to the sign material and mounting surface.

- B. Tape: "VHB Tape" manufactured by 3M, or equal.
- C. Adhesive: "732 Multi-Purpose Sealant Clear" manufactured by Dow Corning Corp., or equal.

2.3 ACCESSORIES

- A. Plastic Cement: "WELD-ON 4" manufactured by IPC Corp., or equal.
- B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install signs using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 - 3. Installed signs must be warrantable. Do not install, correct, or replace signs in a manner that results in any warranty or guarantee becoming void.

- B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach signs to supporting construction.
- C. Installation Tolerances: Install signs to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: Clean all visible sign surfaces in a manner that does not result in any warranty or guarantee becoming void.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed signs in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on or adjacent to or against installed signs unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed signs as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 22 00 – PARTITIONS (ALTERNATE)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Framing system
2. Glazing materials
3. Doors and frames
4. Hardware
5. Accessories
6. Finishes

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:

1. Scheduling: Manufacturer production time shall not exceed four weeks from date of receipt of approved shop drawings.

B. Preinstallation Meeting Attendees and Procedures: Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Demountable partition system components. Mark required options. Include standard details applicable to Project.
2. Doors and hardware.
3. Glazing.
4. Accessories.

B. Shop Drawings:

1. Plans, elevations, sections, and details.
2. Show anchorages to other construction, including concealed supports in walls.
3. Electrical layout (locations only).
4. Door locations, hardware, and details.

- C. Samples: Provide manufactures standard size samples for verification of support system and each type, color, and texture of exposed finish, full thickness:
 - 1. Aluminum Extrusion Components.
 - 2. Cladding Finishes.
 - 3. Linear Trim and Base.
 - 4. Door Face Finishes.
 - 5. Glass.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Partitions and facing.
- B. Warranty Documentation: For specified system.
- C. Installation drawing: Indicating final locations of components.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturers: Specialize in designing and manufacturing stick-built partitions and have production facilities capable of single-source responsibilities and warranty.
 - 2. Installers: Manufacturer or approved by Manufacturer.
- B. Certifications: From Contractor for sound transmission characteristics.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver products until building is enclosed.
- B. Store products inside building.
- C. Protect components and finishes from damage.
- D. Handle in accordance with the manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Ambient Conditions: Perform work within following limitations:
 - 1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.
 - 2. Temperature: 60 degrees F (15.5 C), minimum, 90 maximum degrees F (32.2 C), maximum.
 - 3. Humidity: 25 percent, minimum, 55 percent, maximum.

- B. Existing Conditions: Verify site dimensions before project approval and fabrication. Show site dimensions on production drawing.

1.8 WARRANTY

- A. Manufacturer Warranties:
 - 1. Partition System Components: Repair or replacement of defective components of site assembled structure, cladding system and components.
 - 2. Warranty Period: 10-year limited warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Falkbuilt Ltd.
- B. Contact: Michael S. Yasui, Honolulu Branch, 841 Bishop Street, Ste 1188, Honolulu, HI 96813, 808-237-6001, michael.yasui@falkbuilt.com

2.2 SYSTEM DESCRIPTION

- A. Factory fabricated, site installed partitions, including:
 - 1. Steel framing structure.
 - 2. Face mounted finished cladding.
 - 3. Doors, millwork, finishes, building services components, technology, and accessories.

2.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Stick-built partitions shall be capable of withstanding the effects of gravity loads, dead loads, and the following loads and stresses within limits and under conditions indicated:
 - 1. Deflection: Lateral deflection tested under a uniformly distributed load of 5 psf (0.24 kN/m²), maximum.
 - a. Solid Walls: L/120.
 - b. Glass Walls: L/175 or 3/4 inch (19 mm) whichever is less.
 - 2. Seismic Performance: Partitions shall withstand effects of seismic events without collapse, loss of anchorage, or loss of panels.

- B. Surface-Burning Characteristics: Tested in accordance with ASTM E84 by a qualified independent testing agency.
- C. Acoustical Performance: Provide stick-built partitions with STC rating indicated, determined by testing to ASTM E90 and classified in accordance with ASTM E413.

2.4 FRAMING SYSTEM

- A. Description: Modular system for partitions that can be readily dismantled and reinstalled in other locations.
- B. Framing, Solid Wall System:
 - 1. Bottom Track: ASTM B221 Alloy 6063-T6 extruded aluminum, mill finish.
 - 2. Top Track: ASTM B221 Alloy 6063-T6 extruded aluminum, mill finish or powder coated black.
 - 3. Vertical Super Stud: Cold-rolled steel framing member, ASTM A653/A653M, min. G40 coated.
 - a. Overall finished wall depth for Slimline wall: 4-1/2 inch (114.10 mm), nominal.
 - b. Overall finished wall depth for Standard wall: 6 inch (154 mm), nominal.
 - c. Components: Manufacturer's standard components.
 - 4. Horizontal: ASTM A653/A653M, min. G60 coated.
 - a. Size: 1-5/8 inches (41.3 mm) by 13/16 inches (20.65 mm).
 - b. Components: Manufacturer's standard components.
 - 5. STC Rating: See architect's drawings
 - 6. Leveler Stem: Manufacturer's standard screw adjusted leveling system.
 - 7. Fasteners: Zinc plated steel.

2.5 OPAQUE PANELS

- A. Substrate:
 - 1. Medium Density Fiberboard: ASTM D1037, 3/4 inch (19mm) thick.
 - a. Surface Burning: ASTM E84 (CAN/ULC-S102), Class 3/Class C.
- B. Finish Material: Falkskin.
 - 1. Color and Pattern: Verify with Architect.
- C. Reveals: 5/32 inch (4 mm), standard.

PARTITIONS (ALTERNATIVE)

2.6 GLAZING MATERIALS

- A. Safety Glazing Labels: Permanent certification label in visible location of SGCC or other agency acceptable to authorities having jurisdiction.
- B. Base Glass:
 - 1. Clear Glass: ASTM C1036, Type I, Class 1, Quality-Q3.
 - 2. Heat-Strengthened Glass: ASTM C1048, Type 1, Class 1, Quality Q3:
 - a. Heat Strengthened Glass: Kind HS.
 - b. Tempered Glass: Kind FT.
- C. Laminated Acoustic Glass:
 - 1. 3/8 inch (10 mm).
 - 2. 1/2 inch (12 mm).

2.7 DOORS AND FRAMES

- A. Swinging Doors:
 - 1. Framed Glass Swinging Doors:
 - a. Glass: Double glazed tempered.
 - b. Hinge: Pin.
 - c. Frame: 6063-T6 Extruded aluminum.
 - 1) Finish: Powder coat.
 - 2) Color and Pattern: Verify with Architect.
 - d. Seal: Manufacturer's standard drop seal.
 - 2. Wood Swinging Doors: Flush wood doors with transparent finish.
 - a. Flush Wood Doors: As specified in Division 08 Section "Flush Wood Doors".
 - b. Hinge: Pin.
- B. Sliding Doors
 - 1. Glass Sliding Doors:
 - a. Glass: 1/2 inch tempered.
 - b. Frame: Framed.
 - 1) Finish: Falkskin.
 - a) Color and Pattern: Verify with Architect.

- c. Slide Guide: Manufacturer supplied top aluminum rail and floor guide.
 2. Wood Sliding Doors: Flush wood doors with transparent finish.
 - a. Flush Wood Doors: As specified in Division 08 Section "Flush Wood Doors".
 - b. Slide Guide: Manufacturer supplied top aluminum rail and floor guide.
 - C. Telescoping Doors
 - D. Sliding Door Frames: Aluminum frame single door, continuous track mounted to partition frame system.
- 2.8 HARDWARE
- A. Hardware:
 1. Lever Set: ANSI A156.2.
 - a. Function: As specified in Division 08 Section "Door Hardware"
 - b. Finish: Satin nickel
 - c. Core: SFIC Locking Core. Verify with Architect
 2. Lever Patch: For Framed glass door.
 - a. Function: Framed.
 - b. Finish: Brushed stainless steel.
 - c. Core: SFIC Locking Core. Verify with Architect
 - B. Miscellaneous available hardware.
 1. Magnetic Locks: As specified in Division 08 Section "Door Hardware"
 2. Card Readers: As specified in Division 08 Section "Door Hardware"
 3. Electric Strikes: As specified in Division 08 Section "Door Hardware"
 4. Panic Hardware: As specified in Division 08 Section "Door Hardware"
 5. Push to Exit: As specified in Division 08 Section "Door Hardware"
 - C. Hinges:
 1. Pivots: Manufacturer's standard.
 2. Pin Type: Manufacturer's standard.
 3. Finish: Clear anodized.
 - D. Locks: As specified in Division 08 Section "Door Hardware"

2.9 ACCESSORIES, GENERAL

- A. Ceiling Supports: Cross beams for free-standing rooms.
 - 1. Fascia: 3/4 inch (19 mm) Medium Density Fiberboard: ASTM D1037.
 - 2. Cross Beams: Unfinished laminated veneer lumber.
- B. Connections and Supports: Manufacturer's standard connections and supports that connect and release from floor and ceiling without damage:
 - 1. Carpet grippers.
 - 2. Ceiling track clips.
- C. Cladding Joint Closure: Manufacturer's standard closure trim, capable of closing up to a 25 mm (1 inch) gap.
- D. Millwork: Frameless flush overlay.
 - 1. Medium Density Fiberboard: ASTM D1037-12.
 - a. Panels, top, bottom, side: 3/4 inch (19 mm).
 - b. Panels, back: 5/8 inch (15.9 mm).
 - c. Doors: 3/4 inch (19 mm)
 - 2. Low Pressure Laminate: Mounted to MDF panels, wrapped in thermofoil.
 - 3. Hinges: Manufacturer's standard with 3 point adjustment.
 - 4. Drawers:
 - a. Panels: 5/8 inch (15.9 mm) low-pressure laminate-clad MDF, wrapped in thermofoil.
 - b. Drawer Slides: Manufacturers standard metal (steel), charcoal powder coated.
- E. Healthcare Accessories: Thermoplastic polyurethane elastomer, IC (infection control) filler for reveals in opaque cladding.
 - 1. Overlay IC: Nominal gap 1/2 inch (12.7 mm).
 - a. Type: Inside.
 - 2. Recessed IC: Nominal gap 3/16 inch (4.6 mm).
 - a. Type: Hollow.
 - 3. Ceiling IC Filler: Nominal gap 3/16 inch (4.6 mm).
 - a. Type: In-line.
 - 4. Intersection IC Filler: 3-way and 4-way.
 - 5. Color: Grey.

2.10 ELECTRICAL ACCESSORIES

- A. General: All electrical components to be cULus or cETLus listed and approved.
- B. Conventional:
 - 1. Electrical Mounting Brackets: 14 gauge galvanized sheet steel.
 - 2. Box Material: Galvanized sheet steel.
 - 3. Box Types:
 - a. Octagon Box Depth: 2-1/8 inches (54 mm).
 - b. 1 gang box depth: 2-1/2 inches (63.5 mm).
 - c. 4x4 box depth: 1-1/2 inches (38mm)
- C. Power Whips:
 - 1. Electrical Mounting Brackets: 14 gauge galvanized sheet steel.
 - 2. Boxes: Galvanized sheet steel, 1 gang.
 - 3. Box Depth: 2-1/2 inches (63.5 mm).
 - 4. Conductor: 12-2 AC90
 - 5. Power: 120VAC, 50Hz and 15A/20A.
- D. Quick Connects:
 - 1. Electrical Mounting Brackets: 14 gauge galvanized sheet steel.
 - 2. Boxes: Galvanized sheet steel, 1 gang.
 - 3. Box Depth: 2-1/2 inches (63.5 mm).
 - 4. Conductor: 12-2 AC90.
 - 5. Power: 120VAC, 50Hz and 15A/20A.
- E. Finishes:
 - 1. Receptacles, General: White.
 - 2. Receptacles, Hospital Grade: White (Normal Power), Red (Emergency Power)
 - 3. GFCI Receptacles: White.
 - 4. USB Receptacles: White.
 - 5. Faceplates: White.
- F. AV Boxes:
 - 1. Box Size: Nominal 16 by 10 by 4 inches (406.4 by 254 by 101.6 mm), powder coated black.
 - 2. Door Finish: Falkskin.

2.11 FABRICATION

A. Framing:

1. Fabricate components for installation with concealed fasteners and pressure fit.
2. Fabricate components for installation utilizing fasteners for use in gypsum board ceilings, seismic applications, and doors at base building components.
3. Fabricate components for concealed anchorage and assembly fasteners.
4. Where partitions join fixed construction or require sound attenuation, use manufacturer's standard seals around perimeter.
5. Conceal wiring in frame components. Bundle, lace, and train conductors to terminal points with no excess.

B. Panels:

1. Fabricate to size before delivery.

C. Prepare doors and frames for hardware.

D. Swinging Doors: Fabricate for 1/8 inch (3 mm) jamb and head clearance, 1/4 inch (6 mm) floor clearance.

2.12 STAINLESS STEEL FINISHES

A. Stainless Steel: NAAMM AMP 503, Number 4 satin directional.

2.13 ALUMINUM FINISHES

A. Anodizing: AAMA 611 Class I or AAMA 612 with electro-deposition organic seal.

1. Color: Clear.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Manufacturer of partitions, or manufacturer approved and trained installer.

3.2 EXAMINATION

- A. Verify locations of concealed construction for support and anchorage.
- B. Verify that openings are plumb, level, and square.
- C. Verify that floor and ceiling surfaces are in plane.

3.3 PREPARATION

- A. Clean floor, wall, and ceiling contact surfaces.
- B. Vacuum clean carpet below sill members.

3.4 INSTALLATION

A. General:

- 1. Comply with manufacturer's installation instructions.
- 2. Do not cut metal components except where trimming is indicated on Shop Drawings.
- 3. Install system without gaps at joints with other construction.

B. Framing:

- 1. Install framing plumb, accurately aligned, and free of warp or twist.
- 2. Install components with securely fastened full-contact joints.
- 3. Anchor framing system rigidly and securely to adjacent construction without damaging surfaces.
- 4. Install perimeter gaskets without gaps to provide continuous light and acoustical seals.

C. Opaque Panels:

- 1. Install panels per factory-numbered sequence.

D. Glazing:

- 1. Install glass panels per factory-numbered sequence.
- 2. Install glass on resilient setting blocks in glazing channels.
- 3. Install glazing gaskets with joints only at corners and to provide continuous barrier to air and sound.
- 4. Install glass panels with open vertical joints of uniform width.
- 5. Double Glazing: Clean surfaces that will be inaccessible after installation in framing.

E. Swinging Doors:

- 1. Install doors with uniform jamb and head clearance.
- 2. Adjust doors for smooth, accurate operation and secure latching.
- 3. Adjust closers for ADA compliance.

F. Sliding Doors:

- 1. Align track for smooth, quiet operation.
- 2. Adjust end stops for accurate closed and fully open positions.

G. Systems Integration:

1. Coordinate wiring connections.

H. Tolerances:

1. Plumb: 1/8 inch (3 mm) maximum deviation.
2. Plane: 1/8 inch (3 mm) maximum deviation in 12 feet (4 m).
3. Level: 1/8 inch (3 mm) maximum deviation in 12 feet (4 m) for top of sill.

3.5 CLEANING

A. Clean in accordance with the manufacturer's instructions.

1. Do not use alkaline or abrasive agents.
2. Do not scratch or mar finishes.

B. Provide new replacements for components that are damaged or have soiling or staining that cannot be satisfactorily cleaned.

3.6 CLOSEOUT ACTIVITIES

A. Demonstration: Manufacturer's Authorized Representative will coordinate demonstration with Owner's staff.

3.7 PROTECTION

A. Protection: Protect from damage through the duration of construction activities.

END OF SECTION

SECTION 10 26 00 – WALL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Corner guards.
2. Door frame guards.
3. Resinous protective wall covering.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the wall protection manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
3. Samples:
 - a. Submit at least 8-inch square representative samples of each protective wall covering color, finish, and variety.
 - b. Submit at least 6-inch long representative samples of each corner guard type, color, finish, and variety.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished wall protection.

2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Wall protection must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Surface-Burning Characteristics: Provide wall protection having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective items with undamaged new items that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 CORNER GUARDS

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.2 DOOR FRAME GUARDS

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.3 RESINOUS PROTECTIVE WALL COVERING

- A. Products: Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.4 ACCESSORIES

- A. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- B. Mounting and Material Adhesives: Structural-grade silicone or epoxy adhesives of type recommended or accepted by manufacturer for conditions of use.
- C. Sealant:
 - 1. Description: Clear or white, medium or high modulus, mildew-resistant silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25, Use NT, A or O sealant, as applicable.
 - 2. Products: "786" manufactured by Dow Corning Corp., or "Sanitary SCS 1700" manufactured by Momentive Performance Materials, Inc., or equal.
- D. Solvent: Supplied, required, recommended, or accepted by the manufacturer to clean substrates to ensure adhesion of adhesives and sealants.
- E. Cleaner: Supplied, required, recommended, or accepted by the manufacturer for use on installed wall protection and actual in-service conditions applicable to the project. Cleaners must remove stains, dirt, and residue without damaging or altering wall protection surfaces.
- F. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install wall protection using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 - 3. Installed wall protection must be warrantable. Do not install, correct, or replace wall protection in a manner that results in any warranty or guarantee becoming void.
- B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach wall protection to supporting construction.
- C. Installation Tolerances: Install wall protection to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 - 1. written descriptions of non-conforming, damaged, and defective work;
 - 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 - 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: Clean all visible wall protection surfaces in a manner that does not result in any warranty or guarantee becoming void.
 - 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 - 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 - 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 - 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed wall protection in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on or adjacent to or against installed wall protection unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed wall protection as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 28 13 – COMMERCIAL TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial toilet accessories.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the toilet accessory manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished toilet accessories.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Toilet accessories must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Elements of sanitary facilities must be mounted at locations in conformance with International Building Code.
2. Grab bars in toilet facilities and bathing facilities must conform to the requirements of International Building Code Section 11B-609. Grab bars and any wall or other surfaces adjacent to grab bars must be free of sharp or abrasive elements and must have rounded edges. The space around the grab bars must be as follows:
 - a. 1-1/2-inch between the grab bar and the wall.
 - b. 1-1/2-inch minimum between the grab bar and projecting objects below and at the ends.
 - c. 12 inches minimum between the grab bar and projecting objects above.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective toilet accessories with undamaged new toilet accessories that do not exhibit deterioration, damage, or defects.

- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. Bradley Corp.

2.2 COMMERCIAL TOILET ACCESSORIES

- A. Products: Indicated on the Drawings or selected by the Architect, or equal.
- B. Materials:
 - 1. Stainless-Steel Sheet: ASTM A 666 (annealed and tempered) Type 304 tension leveled to a flatness of 5 I-units or less.
 - 2. Mirrored Glass: ASTM C 1503, Q-1 Mirror Select Quality.

2.3 ACCESSORIES

- A. Pipe Guards:
 - 1. Description: Insulating antimicrobial, molded plastic, white pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
 - 2. Manufacturers: Provide products manufactured by one of the following, or equal.
 - a. Plumberex Specialty Products, Inc.
 - b. IPS Corp.
- B. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install toilet accessories using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 - 3. Installed toilet accessories must be warrantable. Do not install, correct, or replace toilet accessories in a manner that results in any warranty or guarantee becoming void.
- B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach toilet accessories to supporting construction.
- C. Installation Tolerances: Install toilet accessories to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 - 1. written descriptions of non-conforming, damaged, and defective work;
 - 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 - 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: Clean all visible toilet accessory surfaces in a manner that does not result in any warranty or guarantee becoming void.
 - 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 - 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 - 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 - 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed toilet accessories in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on or adjacent to or against installed toilet accessories unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed toilet accessories as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 44 00 – FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire extinguishers.
2. Fire extinguisher cabinets.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the fire protection specialty manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate size of fire extinguisher cabinets to ensure specified fire extinguishers and capacities are accommodated.
2. Coordinate sizes and locations of fire extinguisher cabinets with wall depths.
3. Final location of fire extinguisher cabinets is subject to fire marshal approval.
 - a. Verify cabinet locations with both the fire marshal and the Architect during the framing stage of the project.
 - b. Positioning of cabinets at locations other than where indicated are at no additional cost to the Owner.
4. Where extinguishers are not indicated, assume cabinets and extinguishers are located within 75 feet of any point in the building, or at a rate of one for each 3,000 square feet of building area, or portion thereof, whichever yields the greater number of fire extinguishers.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets

(SDSs), both of which are returned to the Contractor without review or responsive action.

2. Shop Drawings:
 - a. Submit dimensioned plans and elevations drawn to scale and showing fire extinguisher cabinet locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
 - b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.
- B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
 1. Submit manufacturer-prepared published instructions for proper installation of furnished fire protection specialties.
 2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 1. Fire protection specialties must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Regulatory Requirements:
 1. Fire Extinguisher Standard: Fire extinguishers must conform to the requirements of International Code of Regulations Division 1 (State Fire Marshal), Chapter 3 (Fire Extinguishers).
 2. Mounting Height: When installed within the cabinet, bracket-mounted extinguisher handles height must conform to the prescribed limits for an ADA-accessible front-approach reach.
 3. UL Listing:
 - a. Provide UL-listed fire extinguishers bearing the UL listing mark for type, fire classification, and rating specified.

- b. Provide cabinets with the same fire rating as wall in which they are installed.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 - 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 - 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 - 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective fire protection specialties with undamaged new fire protection specialties that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
 - 1. Activar Construction Products Group, Inc.
 - 2. Larsen's Manufacturing Co.
 - 3. Potter Roemer Fire Protection Equipment.

2.2 FIRE EXTINGUISHERS

- A. Description: UL-listed, heavy duty, enameled steel cylinder, multi-purpose dry chemical fire extinguishers conforming to NFPA 10 requirements for portable extinguishers, and bearing the UL listing mark for type, fire classification, and rating specified.
- B. Products: "JL Industries Cosmic 10E" manufactured by Activar Construction Products Group, Inc., or equal.
- C. Requisite Properties:
 - 1. Capacity: 10 pounds.

2. UL Rating: 4-A:80-B:C.
3. Cylinder Diameter: Not more than 5-1/4 inches.
4. Overall Height: Not more than 22 inches.

2.3 FIRE EXTINGUISHER CABINETS

- A. Description: Fire extinguisher cabinets conforming to ASTM E 814 when installed within fire-resistance rated wall assemblies. Cabinets must have the same fire-resistance rating as the wall in which they are installed.
- B. Stainless Steel Cabinets:
 1. Products: "JL Industries Cosmopolitan Series" manufactured by Activar Construction Products Group, Inc., or equal.
 - a. Flat Trim Recessed Cabinets: "Model No. 1035V17" (non-locking) or "Model No. 1035W17" (locking).
 - b. Square Trim Semi-Recessed Cabinets: "Model No. 1036V17" (non-locking) or "Model No. 8136W17" (locking).
 - c. Surface-Mounted Square Cabinets: "Model No. 1033V17" (non-locking) or "Model No. 1033W17" (locking).
 - d. Fire-Rated Cabinets: Provide model numbers with the "-FX2" suffix for fire rated tub option at fire-resistance rated construction.
 2. Requisite Properties:
 - a. Door Style: "Vertical Duo" with tempered safety glass.
 - b. Tub Size: 10-1/2 inches wide by 24 inches high by 6 inches deep.
 - c. Frame Size: 13-5/8 inches wide by 27-1/8 inches.
 - d. Non-Rated Cabinet Rough Opening Size: 11-1/2 inches wide by 25 inches high by 6-1/8 inches deep.
 - e. Fire-Rated Cabinet Rough Opening Size: 12-13/16 inches wide by 26-5/16 inches high by 6-11/16 inches deep.
 - f. Finish: Stainless steel No. 6 (satin) finish.
 - g. Door Hardware: Standard pull handle with "Saf-T-Lok", or equal where indicated as locked.
- C. Accessories:
 1. Mounting Brackets:
 - a. Provide manufacturer's standard brackets sized as required for specified extinguishers; manufacturer's standard finish.
 - b. Provide brackets for all extinguishers, including those mounted in cabinets. Provide manufacturer's standard J-hook wall brackets for extinguishers installed within fire extinguisher cabinets.
 2. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install fire protection specialties using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
 - 3. Installed fire protection specialties must be warrantable. Do not install, correct, or replace fire protection specialties in a manner that results in any warranty or guarantee becoming void.
- B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach fire protection specialties to supporting construction.
- C. Installation Tolerances: Install fire protection specialties to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

- A. Verify smooth and quiet fire extinguisher cabinet door and hardware operation.

- B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.
- C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

- A. Cleaning Work: Clean all visible fire extinguisher cabinetsurfaces in a manner that does not result in any warranty or guarantee becoming void.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
 2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

- A. Protect installed fire protection specialties in place from soiling, deterioration, and damage until Substantial Completion.
- B. Do not store anything on or adjacent to or against installed fire protection specialties unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed fire protection specialties as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 44 16 – PORTABLE FIRE EXTINGUISHER AND CABINET

PART 1 - GENERAL

1.1 SUMMARY

- A. The work includes providing portable fire extinguishers to afford 100 percent complete fire protection coverage throughout the indicated areas. The design, equipment, materials, installation, and workmanship shall be in strict accordance with the required and advisory provisions of NFPA 10, except as modified herein.
- B. The fire extinguisher installation shall include all materials, accessories, and equipment necessary to provide a system complete and ready for use. Design and installation of the system shall be with full consideration to physical obstructions, furniture, and equipment. Portable fire extinguishers shall be listed by the Underwriters' Laboratories, Inc. (UL) or approved by FM Approvals (FM). In the National Fire Protection Association (NFPA) publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word “shall” had been substituted for “should” wherever it appears; reference to the “authority having jurisdiction” shall be interpreted to mean the Building Department and Fire Department. Reference to the “Building Department” on the contract drawings and herein shall be interpreted to mean the County of Hawaii Public Works Building Division; reference to the “Fire Department” shall be interpreted to mean the Hawaii County Fire Department. “Provide” shall mean “furnish and install” when used herein. The work shall begin at the points indicated.

1.2 DEFINITIONS, ABBREVIATIONS, AND ACRONYMS

- A. FM: Factory Mutual
- B. ICC: International Code Council
- C. NFPA: National Fire Protection Association
- D. UL: Underwriters Laboratories, Inc.

1.3 CODES, STANDARDS, AND REGULATIONS

- A. The latest publications listed below form a part of this specification. The publications are referred to in the text by the basic designation only.
 - 1. Factory Mutual (FM) Global:
 - a. FM AG (Updated Online) FM Approval Guide
 - b. Data Sheet 4-5 Portable Extinguishers
 - 2. International Code Council (ICC):

- a. ICC/ANSI A117.7 American National Standard for Accessible and Usable Buildings and Facilities
- b. IBC International Building Code, 2018, as amended by Hawaii County
3. National Fire Protection Association (NFPA):
 - a. NFPA 1 Fire Code, 2018, as amended by Hawaii County
 - b. NFPA 10 Portable Fire Extinguishers, 2018
4. Underwriters Laboratories (UL), Inc:
 - a. UL FPED (Updated Online) Fire Protection Equipment Directory
 - b. UL FRD (Updated Online) Fire Resistance Directory

1.4 SUBMITTALS

A. Submit in accordance with SECTION 01 33 00 - SUBMITTAL PROCEDURES.

1. Manufacturer's Published Data:

- a. As soon as practicable and before installation of any materials or equipment is begun, the Contractor shall submit a complete list of materials and equipment together with names and addresses of manufacturers, catalog numbers, and trade names to the Contracting Officer for approval.
- b. Annotate descriptive data to show the specific model, type, quantity, and size of each item the Contractor proposes to furnish.
- c. Approval of materials will be based on manufacturer's published rating. Any materials and equipment that are not in accordance with these specifications may be rejected.

B. OMISSIONS

1. It is the intent of the plans and specifications to provide a complete installation. Should there be omissions, the Contractor shall call the attention of the Contracting Officer to such omissions 15 days in advance of the date of bid opening so that the necessary corrections can be made.

C. PRODUCT DELIVERY, STORAGE, AND HANDLING

1. Furnish new equipment, materials and accessories bearing the manufacturer's identification. Coordinate deliveries to avoid interference or construction delays. Protect products during delivery, storage, installation, and the remainder of the contract period after installation.
2. Pipe and fittings shall be stored on pallets or blocks a minimum 2 inches above the ground to prevent foreign material from entering piping prior to installation. Pipe ends shall be capped to prevent dirt, water, or other residue from entering.

PART 2 - PRODUCTS

A. MATERIALS AND EQUIPMENT

1. All materials shall be new, of equal or better quality of materials specified. For ease of maintenance and parts replacement, select equipment from a single manufacturer as much as possible.
2. All devices and equipment for fire protection service shall be UL listed or FM approved.

B. EQUIPMENT AND DEVICES

1. Portable Fire Extinguishers: Multipurpose Dry Chemical Fire Extinguisher, Nominal 5 pound: Provide UL listed or FM approved, UL minimum rated 3A:40B:C fire extinguisher with steel or aluminum cylinder. Provide with complete inspection tags.
2. Fire Extinguisher Cabinets: Interior-Mounted Cabinets: Provide flat trim semi-recessed cabinet with steel or aluminum body, white powder coated finish and clear tempered safety glass panel. Cabinet trim shall not project more than 4 inches from the face of the wall. Cabinet shall have a minimum inside box dimension capable of holding specified fire extinguisher. Provide fire-rated cabinets installed in fire-rated walls. The rating of the cabinet shall be no less than the fire-resistance-rating of the wall.

PART 3 - EXECUTION

A. SURFACE CONDITIONS

1. Examine areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions are corrected.

B. INSTALLATION

1. Fire Extinguisher in Cabinet:
 - a. Install cabinets as indicated on Contract Drawings, except that fire extinguisher inside shall be not more than 48 inches above finished floor measured to the top of the operating handle.
 - b. Clearance between bottom of fire extinguisher cabinet and finished floor shall be no less than 4 inches.
 - c. Install portable fire extinguisher with operating instructions and gauge facing outward.
 - d. A minimum of 36 inches in front and 12 inches on each side of the fire extinguisher cabinet shall be kept clear to provide access to the fire extinguisher.

C. FIRE EXTINGUISHER SIGNAGE

1. Provide signage in accordance with NFPA 1, NFPA 10, and Contract Drawings.
2. Provide signage on door where fire extinguishers are not installed in conspicuous locations, such as in locked elevator machine room closets, janitor closets, or similar locations.

END OF SECTION

DIVISION 12

FURNISHINGS

SECTION 12 24 13 – ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Roller window shades.
 2. Shade operation.
 3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

- A. Definitions:
1. Manufacturer: Means the window shade manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
 3. Samples: Submit at least 8-inch square representative samples of each window shade shadecloth color, finish, and variety.
- B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished window shades.
 - a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
 - b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Window shades must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.5 HANDLING

- A. Receiving and Inspection: Inspect all deliveries for deteriorated, damaged, and defective items. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
- B. Unloading: With minimum handling, unload and store only inspected and accepted items.
- C. Storage: Store unloaded items as shipped, upright in their original packaging or containers, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.
- D. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.6 WARRANTY

- A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products manufactured by one of the following, or equal.
1. Draper, Inc.
 2. Lutron Electronics Co., Inc
 3. MechoShade Systems, Inc.

2.2 ROLLER WINDOW SHADES

- A. Products: Provide products manufactured by MechoShade Systems, Inc., or equal.
- B. Requisite Properties:
1. Model: Indicated on the Drawings or selected by the Architect, or equal.
 2. Sunscreen Shadecloth: "ThermoVeil 1300 Series", or equal.
 - a. Material: 75 percent PVC (coating), 25 percent polyester (yarn).
 - b. Size: Fabric width to match window mullion spacing.
 - c. Minimum Thickness: At least 30 mils.
 - d. Total Weight: 13.5 ounces per square yard.
 - e. Openness Factor: 3 percent open.
 - f. Color: Indicated on the Drawings or selected by the Architect.
 - g. Pattern: Basket weave.
 - h. Bottom Hem: Straight.
 - i. Maximum Total Solar Energy Transmitted: (Ts) not more than 4.
 - j. Minimum Total Solar Energy Reflected: (Rs) at least 5.
 - k. Minimum Total Solar Energy Absorbed: (As) at least 91.
 - l. Minimum Visible Light Transmitted: (Tv) at least 4.
 3. Blackout Shadecloth: "Classic Blackout 0700 Series", or equal
 - a. Material: 75 percent PVC (coating), 25 percent polyester (yarn).
 - b. Size: Fabric width to match window mullion spacing.
 - c. Minimum Thickness: At least 32 mils.
 - d. Total Weight: 17.6 ounces per square yard.
 - e. Openness Factor: 0 percent open.
 - f. Color: Indicated on the Drawings or selected by the Architect.
 - g. Pattern: Tightly-woven linear weave.
 - h. Bottom Hem: Straight.
 4. Mounting: Ceiling mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
 5. Direction of Roll: Regular or reverse roll.
 6. Operation: Manual operation.

C. Performance Requirements:

1. Fire Resistance: Provide shade fabrics tested in conformance with NFPA 701, small scale Vertical Burn Test, and rated "PASS".
2. Toxicity: Provide shade fabrics tested in accordance with University of Pittsburgh Toxicity Protocol including LC50 analysis and toxicity characteristics.
3. Anti-Microbial: ASTM G 21 results indicating "No Growth"; ASTM G 22 results indicating minimum 0.197-inch "No Growth Contact Area".

2.3 COMPONENTS

- A. Rollers: Either electro-galvanized or epoxy-primed steel, or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material. Provide capacity for one roller shade band(s) per roller, unless otherwise indicated.
- B. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.
- C. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated; removable design for access.
- D. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.
- E. Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.
- F. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- G. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard for anchoring roller shade bottom in place and keeping shade band material taut.

2.4 SHADE OPERATION

- A. Manual Shade Operation:
 1. Lift-Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.

2. Loop Length: Continuous-loop bead-chain with loop length equal to full length of roller shade.
3. Bead Chain: Stainless steel.

B. Motorized Shade Operation:

1. Description: Factory-assembled motorized shade operation systems, listed and labeled as defined in NFPA 70, Article 100, and designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.
2. Control Equipment: Conforming to NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V AC or DC.
3. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.
4. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure surface mounting. Rocker-style wall switch.
5. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.

2.5 ACCESSORIES

- A. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
- B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install window shades using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed window shades must be warrantable. Do not install, correct, or replace window shades in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach window shades to supporting construction.

C. Installation Tolerances: Install window shades to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet window shade operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 - 1. written descriptions of non-conforming, damaged, and defective work;
 - 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 - 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 PROTECTION

- A. Protect installed window shades in place from soiling, deterioration, and damage until Substantial Completion.

- B. Do not store anything on or adjacent to or against installed window shades unless they are protected from damage, as accepted in writing by the manufacturer's representative.

- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 12 36 63 – SOLID SURFACE MATERIAL COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Solid surfacing countertops.
 2. Solid surface material integral sinks.
 3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

- A. Definitions:
1. Manufacturer: Means the solid surfacing manufacturer, unless otherwise indicated.
 2. Fabricator: Means the countertop fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling:
1. Acclimation: Allow sufficient time in the construction schedule to acclimate countertops to specified ambient conditions for between 72 hours and 6 weeks before installation begins, or until moisture content is not more than 8 percent, when measured with a moisture meter at specified ambient conditions.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data:
 - a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
 - b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
 2. Shop Drawings:

- a. Submit dimensioned plans drawn to scale and showing countertop layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
 - b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans.
 - c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
3. Samples: Submit at least 8-inch square representative samples of each solid surfacing color, finish, and variety.
- B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
- C. Closeout Submittals:
1. Maintenance Data: Submit copies of manufacturer's instructions and other requirements and recommendations for countertop maintenance, cleaning, and repair to the Architect as a condition of project closeout.
 2. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
1. Countertops must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
 - a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
 - b. Items provided for each different installation must be obtained from the same source and manufacturer.
 2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
- B. Quality Standards:
1. Fabrication Standard: Provide countertops conforming to Architectural Woodwork Institute/ Architectural Woodwork Manufacturer's Association of Canada/ Woodwork Institute publication "*Architectural Woodwork Standards*" requirements for each specified Grade.
- C. Qualifications:

1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing countertop material installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
2. Fabricator: Company or individuals must have at least 10 years' experience fabricating countertops installed on at least 100 previous projects similar to this project in size, material, design, and complexity
3. Installer: Company or individuals must have at least 5 years' experience installing countertops for at least 30 previous projects similar to this project in size, material, design, and complexity.
4. Supervisors: Individuals must have at least 7 years' experience installing countertops for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading countertop installers.

1.6 HANDLING

- A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
 1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
 2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
 3. Unload and store only inspected and accepted items.
- B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
 1. Furnish adequate dunnage and bracing during storage.
 2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
 3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
- C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.
- D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective countertops with undamaged new countertops that do not exhibit deterioration, damage, or defects.
- E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

- A. **Manufacturer Warranty:** Furnish to the Owner a written manufacturer warranty for products and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 SOLID SURFACING MATERIAL

- A. **Products:** Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.2 SOLID SURFACING MATERIAL INTEGRAL SINKS

- A. **Products:** Indicated on the Drawings in the Room Finish Schedule and Color & Material Schedule, or equal.

2.3 ACCESSORIES

- A. **Adhesive:** Structural-grade silicone or epoxy adhesives of type recommended or accepted by manufacturer for conditions of use. Tint adhesive visible in finished work to match countertop materials.
- B. **Mounting Spacers:** Supplied, required, recommended, or accepted by the adhesive manufacturer, if required.
- C. **Sealant:**
 - 1. **Description:** White or clear, medium or high modulus, mildew-resistant silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25, Use NT, A or O sealant, as applicable.
 - 2. **Products:** "786" manufactured by Dow Corning Corp., or "Sanitary SCS 1700" manufactured by Momentive Performance Materials, Inc., or equal.
- D. **Solvent:** Supplied, required, recommended, or accepted by the manufacturer to clean countertop surfaces to ensure adhesion of adhesives and sealants.
- E. **Cleaning Agents:** Provide non-abrasive cleansers supplied, required, recommended, or accepted by the manufacturer.
- F. **Other Accessories:** Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 FABRICATION

- A. Shop-fabricate countertops to sizes and shapes indicated on the Drawings and in largest sections practicable to minimize field jointing.
- B. Fabricate exposed work precise, straight, and true to line, size, and shape; square and within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.
- C. Cut, drill, and punch countertops as required to receive other components, accessories, hardware, and similar items, and as required to securely attach to supporting construction. Provide openings and similar features as needed to accommodate adjacent work.
- D. Carefully inspect finished units at the shop for conformance to specified requirements for appearance, material, and fabrication. Replace defective units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
- B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
- C. Evaluation and Assessment:
 - 1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
 - 2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install countertops using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
 - 2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction

3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
4. Installed countertops must be warrantable. Do not install, correct, or replace countertops in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Shim as required using concealed shims.
2. Scribe and fit accurately against adjacent surfaces for a close fit.
3. Attach countertops securely to supports with concealed screws as required for a rigid and secure installation.
4. Seal interface of countertops with contiguous surfaces with sealant.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach countertops to supporting construction.

D. Installation Tolerances: Install countertops to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

- A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
- B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
 1. written descriptions of non-conforming, damaged, and defective work;
 2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
 3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
- C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

- A. Cleaning Work: Clean all visible surfaces in a manner that does not result any warranty or guarantee becoming void.
 1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.

2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
 3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
 4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
- B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

- A. Protect installed countertops in place from deterioration, and damage until Substantial Completion.
- B. Do not store anything on, adjacent to, or against installed countertops unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed countertops as work surfaces.
- C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 21

FIRE SUPPRESSION

SECTION 21 13 13 – WET PIPE FIRE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. The work includes modification of an existing automatic wet pipe sprinkler system to afford 100 percent complete fire protection coverage throughout the indicated areas. The design, equipment, materials, installation, and workmanship of the sprinkler system shall be in strict accordance with the required and advisory provisions of NFPA 13, except as modified herein.
- B. The wet pipe fire sprinkler system installation shall include all materials, accessories, and equipment necessary to provide a system complete and ready for use. Design and installation of the system shall be with full consideration to blind spaces, piping, electrical equipment, ductwork, and all other construction and equipment to afford complete coverage. Devices and equipment for fire protection use shall be listed by the Underwriters' Laboratories, Inc. (UL) or approved by FM Approvals (FM). In the National Fire Protection Association (NFPA) publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the Building Department and Fire Department. Reference to the "Building Department" on the contract drawings and herein shall be interpreted to mean the County of Hawaii Public Works Building Division; reference to the "Fire Department" shall be interpreted to mean the Hawaii County Fire Department. "Provide" shall mean "furnish and install" when used herein. The work shall begin at the points indicated.

1.2 DEFINITIONS, ABBREVIATIONS, AND ACRONYMS

- A. FM: Factory Mutual
- B. ICC: International Code Council
- C. NFPA: National Fire Protection Association
- D. UL: Underwriters Laboratories, Inc.

1.3 CODES, STANDARDS, AND REGULATIONS

- A. The latest publications listed below form a part of this specification. The publications are referred to in the text by the basic designation only.
 - 1. American Society for Testing and Materials (ASTM) International Publications:
 - a. ASTM A 53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - b. ASTM A 135, Electric-Resistance-Welded Steel Pipe

- c. ASTM A 795, Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
2. Factory Mutual (FM) Global:
 - a. FM AG, FM Approval Guide, Updated Online
 - b. Data Sheet 4-5, Portable Extinguishers
3. International Code Council (ICC):
 - a. ICC/ANSI A117.7, American National Standard for Accessible and Usable Buildings and Facilities
 - b. International Building Code (IBC), 2018, as amended by Hawaii County
4. National Fire Protection Association (NFPA):
 - a. NFPA 1, Fire Code, 2018, as amended by Hawaii County
 - b. NFPA 13, Installation of Sprinkler Systems, 2016
5. Underwriters Laboratories (UL), Inc:
 - a. UL FPED, Fire Protection Equipment Directory, Updated Online
 - b. UL FRD, Fire Resistance Directory, Updated Online

B. Installation of all work in this Section shall be made in accordance with State Department of Health Regulations, the National Fire Protection Association, the International Building Code, and the Fire Code.

C. All applicable codes, regulations and ordinances of public bodies having jurisdiction are considered a part of these specifications. All work installed and materials provided must comply with the current edition of such codes, regulations, and ordinances.

1.4 CONTRACT DRAWINGS

1. Contract Drawings are essentially diagrammatic, indicating general layout and approximate locations toward establishing the scope for a uniform estimating basis for all bidders. They are not intended to be detailed construction working drawings.
2. Piping arrangements shall fit into space allotted. Reasonable modifications to indicated locations and arrangement to suit job conditions shall not constitute basis for requesting additional funds from the Owner.
3. Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his or her work to the structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself or herself with all details of the work and notify the Contracting Officer of any discrepancy before performing any work.

1.5 SUBMITTALS

A. Submit in accordance with SECTION 01 33 00 - SUBMITTAL PROCEDURES.

1. Partial submittals will not be acceptable. The Contracting Officer will review and approve all submittals. Before work is commenced, submit for approval complete sets of Manufacturer's Product Data and Shop Drawings for the wet pipe fire sprinkler systems. Contractor shall check the submittals and shop drawings and

certify that they are correct and in compliance with the Contract Drawings and Specifications. Submit an electronic copy of the following for approval.

2. Manufacturer's Published Data:
 - a. As soon as practicable and before installation of any materials or equipment has begun, the Contractor shall submit a complete list of materials and equipment together with names and addresses of manufacturers, catalog numbers, and trade names to the Contracting Officer for approval.
 - b. Annotate descriptive data to show the specific model, type, quantity, and size of each item the Contractor proposes to furnish.
 - c. Approval of materials will be based on manufacturer's published rating. Any materials and equipment that are not in accordance with these specifications may be rejected.
3. Shop Drawings:
 - a. Provide shop drawings showing the wet pipe fire sprinkler system to be installed by the Contractor. Prepare shop drawings on sheets 24 inches by 36 inches using a drawing scale not less than 1/8 inch = 1 foot. Shop drawings shall be prepared in accordance with NFPA 13 and include all data essential to the proper installation of the system. Do not commence work until the design of the systems and the various components have been approved.
 - b. Prior to start of any construction, required copies of to-scale shop drawings of fire sprinkler piping, sprinkler heads, valves, etc. shall be submitted for review. No work shall be started without approval of the Contracting Officer. Shop drawings shall be fully dimensioned to show that the equipment and connections thereto fit within the space provided.
 - c. Review of shop drawings is confined to arrangement of equipment only and does not relieve the Contractor from responsibility for proper fit, performance, and construction. Any deviation from the Contract Drawings and/or specifications shall be clearly noted on the shop drawings. Since manufacturing methods vary, reasonable variations from the Contract Documents are acceptable; however, performance and material requirements are a minimum and the Contracting Officer retains the right to judge the equality of any variation.
4. Certificates of Compliance:
 - a. Contractor's material and test certificates for aboveground piping per NFPA 13.
5. Field Posted As-Built Drawings: Upon completion of work, submit accurate as-built drawings to the Contracting Officer. As-built fire sprinkler shop drawings shall be stamped by a Professional Engineer registered in the State of Hawaii. Show exact locations and sizes, as actually installed, of the fire sprinkler systems on these record "as-built" drawings. Include a copy of the record drawings in each copy of the operation and maintenance manual described below.
6. Guarantee:
 - a. Contractor and Installer shall guarantee and certify in writing all work in this section for a period of 1 year. Contractor shall be responsible for all damages to any part of premises during equipment installation work under this section.
 - b. The entire fire protection installation described hereinafter shall be guaranteed as a complete working unit for a period of 1 year. In the event of failure due to faulty workmanship or materials during this period, all said failures shall be

corrected to the satisfaction of the Contracting Officer at no additional cost to the Owner for labor and material.

- c. The 1-year guarantee shall start at the end of 30 consecutive days of trouble-free operation after acceptance by the Owner.
- d. The above guarantee shall not be interpreted as voiding, limiting, or reducing any equipment manufacturer's warranty or any guarantee permitted by law.

B. OMISSIONS

1. It is the intent of the plans and specifications to provide a complete installation. Should there be omissions, the Contractor shall call the attention of the Contracting Officer to such omissions 15 days in advance of the date of bid opening so that the necessary corrections can be made.

C. PRODUCT DELIVERY, STORAGE, AND HANDLING

1. Furnish new equipment, materials and accessories bearing the manufacturer's identification. Coordinate deliveries to avoid interference or construction delays. Protect products during delivery, storage, installation, and the remainder of the contract period after installation.
2. Pipe and fittings shall be stored on pallets or blocks a minimum 2 inches above the ground to prevent foreign material from entering piping prior to installation. Pipe ends shall be capped to prevent dirt, water, or other residue from entering.

PART 2 - PRODUCTS

A. MATERIALS AND EQUIPMENT

1. All materials shall be new, of equal or better quality of materials specified. For ease of maintenance and parts replacement, select equipment from a single manufacturer as much as possible.
2. All devices and equipment for fire protection service shall be UL listed or FM approved.

B. DESIGN OF SPRINKLER SYSTEM

1. Hazard Classification shall be in accordance with NFPA 13 and as indicated on Contract Drawings.
2. Location and spacing of sprinklers shall be in accordance with NFPA 13. Sprinklers shall be spaced uniformly on branch lines.
3. Branch line pipe sizes shall remain in accordance with existing sprinkler system pipe schedule, or as indicated on Contract Drawings.
4. Pipe sizes shall remain in accordance with the existing fire sprinkler system. Contractor shall submit hydraulic calculations if greater sprinkler spacing or smaller pipe sizing is used. Contractor shall submit hydraulic calculations if additional fire sprinklers are supplied from the existing branch lines exceeding the existing pipe schedule.
5. Arrangement: Conceal all pipes in areas with ceilings.

6. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.
 - a. Overheat wet pipe automatic sprinkler system including piping and sprinkler heads in accordance with NFPA 13.
 - b. Testing.
 - c. Draining.

C. EQUIPMENT AND DEVICES

1. Fire Sprinklers: Provide automatic closed head sprinklers as indicated on Contract Drawings. New sprinklers shall not be equipped with O-ring seals. Sprinklers shall be UL listed or FM approved.
2. Fire Sprinkler Piping:
 - a. Pipe: Provide in accordance with NFPA 13, except that all piping shall be black steel. Pipe sizes less than 2-1/2 inches in diameter shall be Schedule 40. Pipe sizes 2-1/2 inches and larger shall be Schedule 10 or 40. Plastic pipe and copper tubing shall not be permitted.
 - b. Fittings: Fittings shall be welded, threaded, or grooved-end type, UL listed or FM approved for use in sprinkler systems. Fittings for pipe sizes 1-1/4 inches in diameter and smaller shall be threaded. Make changes in pipe sizes through standard tapered reducing pipe fittings. Use of bushings will not be permitted. Press-fit fittings, snap-fit fittings, U-bolt style mechanical tees, and plain-end fittings that utilize steel gripping devices to bite into pipe when pressure is applied will not be permitted. Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread tape or pipe cement; apply on only on male threads. Welding shall be performed in the shop; field welding will not be permitted. All pipe and fittings aboveground and exposed to ambient air shall be painted.
 - c. Flexible Pipe Drops: Flexible piping assemblies shall not be permitted unless Contractor submits hydraulic calculations.
 - d. Pipe Hangers and Bracing: Provide hangers, supports, inserts, earthquake sway bracing, branch line restraint, and associated items to properly support fire sprinkler system piping in accordance with pertinent provisions of NFPA 13. Listed clamps shall be used to secure hanger, earthquake sway bracing, and restraint assemblies to metal building structural members, such as beams, trusses, and purlins; through bolts or other methods which require drilling or other means of removing portions of the metal structural element will not be permitted. Provide retaining straps for all beam clamps. Provide means to restrain the upward movement of piping at the last hanger, such as surge clips, on all branch lines and armovers for all sprinkler systems. Provide means to restrain the lateral movement of piping at the last hanger, such as sway bracing, on all branch lines and armovers for all sprinkler systems. Provide additional hangers to support the concentrated loads in piping between hangers, such as for flanged valves. All hangers, rods, bracing, and hanger components exposed to ambient air shall be painted.
 - e. Branch Line Restraints: Provide branch line restraints on all new fire sprinkler piping in accordance with NFPA 13.

- f. Pipe Penetrations: Where piping passes through walls, floors, roofs, and partitions, provide clearances in accordance with NFPA 13. Cores through concrete walls shall be ground smooth. Firmly pack annular space with insulation and caulk at both ends of sleeve with a flexible, waterproof cement. For penetrations through fire rated walls, floor/ceiling, or roof assemblies, fire stop penetration per UL listed firestop system.
3. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor, subject to the approval of the Contracting Officer.

PART 3 - EXECUTION

A. SURFACE CONDITIONS

1. Examine areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions are corrected.

B. INSTALLATION

1. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.
2. Install the work of this section in strict accordance with the approved design drawings and the requirements of the Fire Department, Building Department, and applicable governmental agencies.
3. Equipment, material, installation, and workmanship shall be in accordance with NFPA 13 except as modified herein. Install piping straight and true to bear evenly on hangers. Keep the interior of new piping affected by the Contractor's operations thoroughly clean of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping and fittings so that water and foreign matter will not enter the pipes or fittings. Inspect piping before placing into position. Piping shall be inspected, tested, and approved before covering or concealing. Seal both ends of penetrations through fire rated walls, floor/ceiling assemblies, and roof assemblies to maintain fire resistive integrity with UL listed through-penetration fire stop assembly. Sprinkler piping shall be supported from the building structure; sprinkler piping shall not be supported from sprinkler piping.
4. Contractor shall center sprinkler heads in ceiling tiles as indicated on Contract Drawings.
5. Conceal all pipes in areas with finished ceilings.
6. Provide branch line restraint in accordance with NFPA 13.

C. SPRINKLER SYSTEM IMPAIRMENT

1. The Contractor shall impair only sections of the sprinkler system where work is involved and the remainder of the system shall be kept in service. Prior to impairing the water supply to the existing sprinkler system, the Contractor shall comply with all provisions of Chapter 16, 2018 NFPA 1 and notify the Building Manager to receive instructions on any additional fire safety precautions which must be observed during

the sprinkler system impairment. The Contractor is responsible for following these precautions during the entire impairment. When the system is restored to normal working order, the Contractor shall verify that all control valves are fully open. The maximum duration of sprinkler system impairment for areas impacted by this work shall be 8 hours, or as restricted by the Building Manager.

D. FIELD TESTING OF FIRE SPRINKLER SYSTEMS

1. Preliminary Testing and Inspections: Testing shall be performed in accordance with NFPA 13 and this specification. Testing shall be considered successful when accepted by the Architect.
 - a. Perform in-service testing for new fire sprinkler system piping installed by the Contractor. Piping above suspended ceilings shall be tested before installation of ceilings. Furnish test certificate to the Architect.
 - b. Perform visual inspection of the fire sprinkler and piping installation to verify compliance with contract documents and NFPA 13. Submit the request for visual inspection at least 15 days prior to the date the inspection is to take place. Correct defects in the work provided by the Contractor such that the system complies with all contract requirements.
 - c. When tests have been completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13, with a request for formal inspection and tests.
2. Formal Inspection and Tests: The Architect shall witness formal tests and approve all systems before they are accepted. Submit the request for formal inspection at least 15 days prior to the date the formal inspection is to take place. An experienced technician regularly employed by the Sprinkler Installer shall be present during the inspection. At this inspection, repeat any or all of the required tests as directed. Correct defects in the work provided by the Contractor, and make additional tests until it has been demonstrated that the system complies with all contract requirements. Furnish appliances, equipment, instruments, connecting devices, and personnel for the tests.

END OF SECTION

DIVISION 22

PLUMBING

SECTION 22 05 23.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Brass ball valves.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
1. Certification that products comply with NSF 61 and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 3. ASME B16.18 for solder-joint connections.
 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
1. Gear Actuator: For quarter-turn valves NPS 4 (DN 100) and larger.
 2. Handlever: For quarter-turn valves smaller than NPS 4 (DN 100).
- H. Valves in Insulated Piping:
1. Include 2-inch (50-mm) stem extensions.

2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

A. Two-Piece, Brass Ball Valves with Full Port and Brass Trim:

1. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig (4140 kPa).
 - c. Body Design: Two piece.
 - d. Body Material: Forged brass.
 - e. Ends: Threaded and soldered.
 - f. Seats: PTFE.
 - g. Stem: Brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 2. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.

3.3 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Two-piece, brass ball valves with full port and brass trim.

END OF SECTION

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Domestic recirculating hot-water piping.
 - 3. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Type I, 850 Deg F (454 Deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- D. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.
 - 4. Color: White.

2.5 SEALANTS

- A. Joint Sealants:
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 - 4. Color: White.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Adhesive: As recommended by jacket material manufacturer.
 2. Color: White.
 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
1. Factory cut and rolled to size.
 2. Finish and thickness are indicated in field-applied jacket schedules.
 3. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
 4. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
 5. Factory-Fabricated Fitting Covers:
 - a. Same material, finish, and thickness as jacket.
 - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - c. Tee covers.
 - d. Flange and union covers.
 - e. End caps.
 - f. Beveled collars.
 - g. Valve covers.
 - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- D. Underground Direct-Buried Jacket: 125-mil- (3.2-mm-) thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Width: 3 inches (75 mm).
 2. Thickness: 11.5 mils (0.29 mm).
 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.

6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 1. Width: 2 inches (50 mm).
 2. Thickness: 6 mils (0.15 mm).
 3. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 1. Width: 2 inches (50 mm).
 2. Thickness: 3.7 mils (0.093 mm).
 3. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.9 SECUREMENTS

- A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- C. Wire: 0.062-inch (1.6-mm) soft-annealed, stainless steel.

2.10 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
 1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.

- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 07 84 00 - Firestopping for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 00 - Firestopping.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- C. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.7 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 91 00 – Painting.
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, locations of welded strainers, locations of threaded valves, and locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 1. Drainage piping located in crawl spaces.
 2. Underground piping.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water: Insulation shall be the following:
 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick for pipes 1-1/4" and smaller, 1-1/2" (25mm) thick for pipes 1-1/2" and larger.

3.11 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water: Insulation shall be the following:
 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches (50 mm) thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 1. None.

- D. Piping, Exposed:
 - 1. PVC: 20 mils (0.5 mm) thick.

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. Aluminum, Smooth: 0.020 inch (0.51 mm) thick.
- D. Piping, Exposed:
 - 1. Aluminum, Smooth: 0.024 inch (0.61 mm) thick.

3.14 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Copper tube and fittings.
 2. Piping joining materials.
 3. Transition fittings.
 4. Dielectric fittings.

1.2 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."
- C. Comply with NSF 372 for low lead.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Standard: ASSE 1079.
 2. Pressure Rating: 150 psig (1035 kPa).
 3. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
1. Standard: ASSE 1079.
 2. Factory-fabricated, bolted, companion-flange assembly.
 3. Pressure Rating: 150 psig (1035 kPa).
 4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
1. Nonconducting materials for field assembly of companion flanges.
 2. Pressure Rating: 150 psig (1035 kPa).
 3. Gasket: Neoprene or phenolic.
 4. Bolt Sleeves: Phenolic or polyethylene.
 5. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
1. Standard: IAPMO PS 66.
 2. Electroplated steel nipple complying with ASTM F 1545.
 3. Pressure Rating and Temperature: 300 psig (2070 kPa) at 225 deg F (107 deg C).
 4. End Connections: Male threaded or grooved.
 5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for drain valves and strainers in Section 22 11 19 - Domestic Water Piping Specialties.
- D. Install shutoff valve immediately upstream of each dielectric fitting.

- E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 - Domestic Water Piping Specialties.
- F. Install domestic water piping level without pitch and plumb.
- G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- H. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 23 05 48 - Vibration and Seismic Controls for Fire Suppression, Plumbing and HVAC Piping and Equipment.
- I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- J. 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.
- K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- L. Install piping to permit valve servicing.
- M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- N. Install piping free of sags and bends.
- O. Install fittings for changes in direction and branch connections.
- P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
- R. Install sleeve seals for piping penetrations of concrete walls and slabs.
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors.
- T. Paint all exposed piping with minimum 2 coats of marine grade epoxy paint. Coordinate with architect on color.

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 (DN 50) and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings, nipples or unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
- D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 23 05 48 - Vibration and Seismic Controls for Fire Suppression, Plumbing and HVAC Piping and Equipment.
- B. Comply with requirements for pipe hanger, support products, and installation in Section 23 05 29 - Hangers and Supports for Fire Suppression, Plumbing and HVAC Piping and Equipment.
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
 - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
 - 4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
 - 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
 - 6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
 - 7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.
- F. Install supports for vertical copper tubing every 10 feet (3 m).
- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4 (DN 32) and Smaller: 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
 - 3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
 - 4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
 - 5. NPS 3 and NPS 3-1/2 (DN 80 and DN 90): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
 - 6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.

7. NPS 6 (DN 150): 12 feet (3.7 m) with 3/4-inch (19-mm) rod.
8. NPS 8 to NPS 12 (DN 200 to DN 300): 12 feet (3.7 m) with 7/8-inch (22-mm) rod.

- H. Install supports for vertical steel piping every 15 feet (4.5 m).
- I. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 23 05 53 - Identification for HVAC and Plumbing Piping and Equipment.
- B. Label pressure piping with system operating pressure.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.

- b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures until the water passes the Heterotrophic Plate Count (HPC) and coliform testing. HPC count shall be less than 500 bacterial colony-forming unit per milliliter and no coliform present.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper, solder-joint fittings; and soldered joints.
 - 2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.

END OF SECTION

SECTION 22 11 19 -DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Balancing valves.
 - 5. Water-hammer arresters.
 - 6. Trap-seal primer device.
- B. Related Requirements:
 - 1. Section 22 11 16 - Domestic Water Piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
 - 1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 and NSF 14. Mark "NSF-pw" on plastic piping components.
- B. Comply with NSF 372 for low lead.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 150 psig (1,034 kPa) unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Standard: ASSE 1001.
 - 2. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: Threaded.
 - 5. Finish: Rough bronze.
- B. Hose-Connection Vacuum Breakers:
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, nonremovable, with manual drain.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 4. Finish: Chrome or nickel plated.

2.4 BACKFLOW PREVENTERS

- A. Intermediate Atmospheric-Vent Backflow Preventers:
 - 1. Standard: ASSE 1012.
 - 2. Operation: Continuous-pressure applications.
 - 3. Size: NPS 1/2 or NPS 3/4.
 - 4. Body: Bronze.
 - 5. End Connections: Union or solder joint.
 - 6. Finish: Rough bronze.
- B. Reduced-Pressure-Principle Backflow Preventers:
 - 1. Standard: ASSE 1013.
 - 2. Operation: Continuous-pressure applications.

3. Pressure Loss: 12 psig maximum, through middle third of flow range.
4. Body: Bronze or stainless steel for NPS 2 and smaller; ductile or cast iron with interior lining that complies with AWWA C550 or that is FDA approved or stainless steel for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; [flanged] <Insert type> for NPS 2-1/2 (DN 65) and larger.
6. Configuration: Designed for [horizontal, straight-through] [vertical-inlet, horizontal-center-section, and vertical-outlet] [vertical] <Insert configuration> flow.
7. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Standard: ASSE 1003.
2. Pressure Rating: Initial working pressure of 150 psig.
3. Design Outlet Pressure Setting: 80 psig max.
4. Body: Bronze with chrome-plated finish for NPS 2 and smaller; bronze or cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
5. Valves for Booster Heater Water Supply: Include integral bypass.
6. End Connections: Threaded or solder for NPS 2 and smaller; flanged or solder for NPS 2-1/2 and NPS 3.

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
3. Size: NPS 2 (DN 50) or smaller.
4. Body: Copper alloy.
5. Port: Standard or full port.
6. Ball: Chrome-plated brass.
7. Seats and Seals: Replaceable.
8. End Connections: Solder joint or threaded.
9. Handle: Vinyl-covered steel with memory-setting device.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 (DN 50) and Smaller: 0.020 (0.51) inch (mm).
 - b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 (1.14) inch (mm).
 - c. Strainers NPS 5 (DN 125) and Larger: 0.10 (2.54) inch (mm).
6. Drain: Factory-installed, hose-end drain valve.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Metal bellows, Piston or Diaphragm.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.9 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1018.
2. Pressure Rating: 125 psig minimum.
3. Body: Bronze.
4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Balancing Valves: Install in locations where they can easily be adjusted.
- B. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 IDENTIFICATION

- A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Pressure vacuum breakers.
 - 2. Intermediate atmospheric-vent backflow preventers.
 - 3. Reduced-pressure-principle backflow preventers.
 - 4. Water pressure-reducing valves.
 - 5. Automatic water shutoff valves.
 - 6. Calibrated balancing valves.
 - 7. Outlet boxes.
 - 8. Hose stations.
 - 9. Supply-type, trap-seal primer valves.
 - 10. Trap-seal primer systems.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 23 05 53 - Identification for HVAC and Plumbing Piping and Equipment.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.

END OF SECTION

SECTION 22 13 16 -SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Cast-iron soil pipe and fittings.
 2. PVC pipe and fittings.
 3. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A888 or CISPI 301.
1. Standards: ASTM C 1277 and CISPI 310.
 2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- B. Heavy-Duty, Hubless-Piping Couplings:
1. Standards: ASTM C 1277 and ASTM C 1540.

2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-DWV" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

2.4 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 2. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.
 - d. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
 3. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 - 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. 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.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 23 05 48 - Vibration and Seismic Controls for Fire Suppression, Plumbing and HVAC Piping and Equipment.
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 - 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - a. Straight tees, elbows, and crosses may be used on vent lines.
 - 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.

- L. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 2 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 - 2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- O. Install underground PVC piping according to ASTM D 2321.
- P. Plumbing Specialties:
 - 1. Install backwater valves in sanitary waster gravity-flow piping.
 - a. Comply with requirements for backwater valves specified in Section 22 13 19 - Sanitary Waste Piping Specialties.
 - 2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - a. Comply with requirements for cleanouts specified in Section 22 13 19 - Sanitary Waste Piping Specialties.
 - 3. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 22 13 19 - Sanitary Waste Piping Specialties.
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- R. Install sleeves for piping penetrations of walls, ceilings, and floors.
- S. Install sleeve seals for piping penetrations of concrete walls and slabs.
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

- A. Join hubless, cast-iron soil piping with joints according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

- B. Plastic, Nonpressure-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. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.3 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in ODs.
 - 2. In Waste Drainage Piping: Unshielded, nonpressure transition couplings.

3.4 VALVE INSTALLATION

- A. Comply with requirements in Section 22 05 23.12 - Ball Valves for Plumbing Piping.
- B. Shutoff Valves:
 - 1. Install shutoff valve on each sewage pump discharge.
 - 2. Install gate or full-port ball valve for piping NPS 2 (DN 50) and smaller.
 - 3. Install gate valve for piping NPS 2-1/2 (DN 65) and larger.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 23 05 48 - Vibration and Seismic Controls for Fire Suppression, Plumbing and HVAC Piping and Equipment.
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 23 05 29 - Hangers and Supports for Plumbing and HVAC Piping and Equipment.
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments (outdoors and ventilated spaces).
 - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 6. Install individual, straight, horizontal piping runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
 3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
 4. NPS 6 and NPS 8 (DN 150 and DN 200): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
 5. NPS 10 and NPS 12 (DN 250 and DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.
 6. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).
- G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- H. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
 4. NPS 6 and NPS 8 (DN 150 and DN 200): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
 5. NPS 10 and NPS 12 (DN 250 and DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.
- I. Install supports for vertical PVC piping every 48 inches (1200 mm).
- J. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Install horizontal backwater valves with cleanout cover flush with floor.
 - 6. Comply with requirements for cleanouts and drains specified in Section 22 13 19 - Sanitary Waste Piping Specialties.
 - 7. Equipment: Connect waste piping as indicated.
 - a. Provide shutoff valve if indicated and union for each connection.
 - b. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 23 05 53 - Identification for HVAC and Plumbing Piping and Equipment.

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa).
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
 - c. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
 - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa).
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
 - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be the following:
 1. Hubless, cast-iron soil pipe and fittings.
 2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Miscellaneous sanitary drainage piping specialties.

1.2 DEFINITIONS

- A. PVC: Polyvinyl chloride.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
2. Size: Same as connected drainage piping
3. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure: Countersunk or raised-head, plastic plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Closure: Stainless-steel plug with seal.

B. Cast-Iron Exposed Floor Cleanouts:

1. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
2. Size: Same as connected branch.
3. Type: Heavy-duty, adjustable housing.
4. Body or Ferrule: Cast iron.
5. Clamping Device: Not required.
6. Outlet Connection: Threaded.
7. Closure: Plastic plug.
8. Adjustable Housing Material: Cast iron with threads.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure Plug:
 - a. Brass.
 - b. Countersunk or raised head.
 - c. Drilled and threaded for cover attachment screw.
 - d. Size: Same as or not more than one size smaller than cleanout size.
5. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
6. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.

5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch (25 mm) above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

E. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

F. Expansion Joints:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backwater valves in building drain piping.

1. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 07 60 00 - Sheet Metal Flashing and Trim.
- F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 07 60 00 - Sheet Metal Flashing and Trim.
- G. Assemble open drain fittings and install with top of hub 1 inch (25 mm) above floor.
- H. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.
- J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- K. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.
- L. Install vent caps on each vent pipe passing through roof.
- M. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- N. Install wood-blocking reinforcement for wall-mounting-type specialties.
- O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 22 13 16 - Sanitary Waste and Vent Piping for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

- A. Comply with requirements in Section 07 60 00 - Sheet Metal Flashing and Trim.
- B. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.
- C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.
- D. Set flashing on floors and roofs in solid coating of bituminous cement.
- E. Secure flashing into sleeve and specialty clamping ring or device.
- F. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07 60 00 - Sheet Metal Flashing and Trim.
- G. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 1. Nameplates and signs are specified in Section 23 05 53 - Identification for HVAC and Plumbing Piping and Equipment.

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING

SECTION 23 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING AND HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Sleeves.
 2. Sleeve-seal systems.
 3. Grout.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: Plastic.
 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 - Joint Sealants.
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 00 - Firestopping.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller than NPS 6: Galvanized-steel-pipe sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - 5. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 23 05 18 -ESCUTCHEONS FOR PLUMBING AND HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.

- d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
- 1. New Piping: One-piece, floor-plate type.
- 3.2 FIELD QUALITY CONTROL
- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR FIRE SUPPRESSION, PLUMBING AND
HVAC PIPING IAND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Metal pipe hangers and supports.
 2. Trapeze pipe hangers.
 3. Thermal-hanger shield inserts.
 4. Fastener systems.
 5. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
1. Trapeze pipe hangers.
 2. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of hot-dipped galvanized steel.
- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- C. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09 91 00 - Painting.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications such as all outdoor or naturally-ventilated spaces.
- G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing. Use stainless steel hangers and attachments such as all outdoor or naturally-ventilated spaces.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 3. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 4. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 5. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 6. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 7. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 8. C-Clamps (MSS Type 23): For structural shapes.
 9. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 10. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 11. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING AND HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric hangers.
2. Spring hangers.
3. Restraint cables.
4. Seismic-restraint accessories.
5. Mechanical anchor bolts.

B. ACTION SUBMITTALS

C. Product Data: For each type of product.

D. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.2 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: TBD.
 - 2. Assigned Seismic Occupancy Category as Defined in the IBC: III.
 - a. Component Importance Factor: 1.5.
 - b. Component Response Modification Factor: Refer to ASCE 7, Table 13.6-1.
 - c. Component Amplification Factor: Refer to ASCE 7, Table 13.6-1.
 - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): TBD.
 - 4. Design Spectral Response Acceleration at 1.0-Second Period: TBD.
 - 5. Seismic Design Category: TBD.
- B. Static Deflection: Unless noted otherwise, use a 2" static deflection for spring isolators.
- C. For outdoor or naturally ventilated applications, isolator material shall be one of the following:
 - 1. Stainless steel
 - 2. Corrosion coating for specific use in coastal or marine environments.
 - 3. Minimum two (2) coats of epoxy paint.

2.2 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
 - 1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
 - 2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.3 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:
 - 1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 - 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.4 RESTRAINT CABLES

- A. Restraint Cables: ASTM A 603 galvanized or ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement. Provide stainless steel cables for applications in spaces that are naturally ventilated or subject to the outdoors.

2.5 SEISMIC-RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- B. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- C. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- D. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 EXECUTION

3.1 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 03 30 00 - Cast-In-Place Concrete.
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Equipment Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- D. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
 - 3. Brace a change of direction longer than 12 feet (3.7 m).
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- I. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 5. Test to 90 percent of rated proof load of device.
 6. Measure isolator restraint clearance.
 7. Measure isolator deflection.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION

SECTION 23 05 53 - IDENTIFICATION FOR HVAC AND PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Equipment labels.
 2. Warning signs and labels.
 3. Pipe labels.
 4. Duct labels.

1.2 ACTION SUBMITTAL

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 2. Letter Color: White.
 3. Background Color: Black.
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, plus the Specification Section number and title where equipment is specified.

- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Black.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Section 09 91 00 - Painting.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
 - 1. Chilled-Water Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
 - 2. Reheat Hot Water Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.
 - 3. Oxygen Gas Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
 - 4. Medical Vacuum Piping:
 - a. Background Color: White.
 - b. Letter Color: Black.
 - 5. Domestic Hot Water and Hot Water Return Piping:
 - a. Background Color: Red.
 - b. Letter Color: White.
 - 6. Domestic Cold-Water Piping:
 - a. Background Color: Black.
 - b. Letter Color: White.
 - 7. Sanitary Waste and Vent Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
 - 3. ASME A13.1 Colors and Designs: For hazardous material exhaust.

- B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Variable-air-volume systems.
 - 2. Balancing Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.
 - b. Variable-flow hydronic systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

- A. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.4 INFORMATIONAL SUBMITTALS

- A. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.

2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.
- B. TAB Specialists Qualifications: Certified by NEBB or TABB.
 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.
 - C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
 - D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 1. Airside:
 - a. Duct systems are complete with terminals installed.
 - b. Volume, smoke, and fire dampers are open and functional.
 - c. Clean filters are installed.
 - d. Fans are operating, free of vibration, and rotating in correct direction.
 - e. Variable-frequency controllers' startup is complete and safeties are verified.
 - f. Automatic temperature-control systems are operational.

- g. Ceilings are installed.
 - h. Windows and doors are installed.
 - i. Suitable access to balancing devices and equipment is provided.
2. Hydronics:
- a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with terminals installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.
 - f. Control valves are functioning per the sequence of operation.
 - g. Shutoff and balance valves have been verified to be 100 percent open.
 - h. Pumps are started and proper rotation is verified.
 - i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
 - j. Variable-frequency controllers' startup is complete and safeties are verified.
 - k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in ASHRAE 111 and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements.
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed.

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Adjust the variable-air-volume systems as follows:
 - 1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
 - 2. Verify that the system is under static pressure control.
 - 3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 - 4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
 - a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
 - b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
 - c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
 - d. Adjust controls so that terminal is calling for minimum airflow.

- e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
 - f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
 - g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.
5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
- a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
 - c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
6. Measure fan static pressures as follows:
- a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
- a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
 - b. Verify that terminal units are meeting design airflow under system maximum flow.
8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:
- a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
 - b. Re-measure and confirm that total airflow is within design.

- c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
- d. Mark final settings.
- e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
- f. Verify tracking between supply and return fans.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
 1. Check liquid level in expansion tank.
 2. Check highest vent for adequate pressure.
 3. Check flow-control valves for proper position.
 4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 5. Verify that motor starters are equipped with properly sized thermal protection.
 6. Check that air has been purged from the system.

3.7 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design GPM.
 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
 1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 1. Measure flow at terminals.
 2. Adjust each terminal to design flow.
 3. Re-measure each terminal after it is adjusted.
 4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 5. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent valves at terminals:
 1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent valves or flow-measuring devices at terminals:
 1. Measure and balance coils by either coil pressure drop or temperature method.
 2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- F. Verify final system conditions as follows:
 1. Re-measure and confirm that total water flow is within design.
 2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 3. Mark final settings.
- G. Verify that memory stops have been set.

3.8 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.
- B. Adjust the variable-flow hydronic system as follows:
 1. Verify that the differential-pressure sensor is located as indicated.
 2. Determine whether there is diversity in the system.

- C. For systems with no diversity:
1. Adjust pumps to deliver total design GPM.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
 2. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
 4. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
 5. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

6. Prior to verifying final system conditions, determine the system differential-pressure set point.
 7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
 8. Mark final settings and verify that all memory stops have been set.
 9. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
 10. Verify that memory stops have been set.
- D. For systems with diversity:
1. Determine diversity factor.
 2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
 3. Adjust pumps to deliver total design GPM.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
 4. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.

5. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
6. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure, and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
7. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
9. Prior to verifying final system conditions, determine system differential-pressure set point.
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
13. Verify that memory stops have been set.

3.9 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.
 3. Cooling-Water Flow Rate: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.10 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.

- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves.
 - 2. Fan curves.
 - 3. Manufacturers' test data.
 - 4. Field test reports prepared by system and equipment installers.
 - 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB specialist.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 - 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.

- d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in CFM.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.

- d. Discharge static pressure in inches wg.
- e. Filter static-pressure differential in inches wg.
- f. Preheat-coil static-pressure differential in inches wg.
- g. Cooling-coil static-pressure differential in inches wg.
- h. Heating-coil static-pressure differential in inches wg.
- i. Outdoor airflow in CFM.
- j. Return airflow in CFM.
- k. Outdoor-air damper position.
- l. Return-air damper position.
- m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

- a. System identification.
- b. Location.
- c. Coil type.
- d. Number of rows.
- e. Fin spacing in fins per inch o.c.
- f. Make and model number.
- g. Face area in sq. ft.
- h. Tube size in NPS.
- i. Tube and fin materials.
- j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

- a. Airflow rate in CFM.
- b. Average face velocity in FPM
- c. Air pressure drop in inches wg.
- d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
- e. Return-air, wet- and dry-bulb temperatures in deg F.
- f. Entering-air, wet- and dry-bulb temperatures in deg F.
- g. Leaving-air, wet- and dry-bulb temperatures in deg F.
- h. Water flow rate in GPM.
- i. Water pressure differential in feet of head or psig.
- j. Entering-water temperature in deg F.
- k. Leaving-water temperature in deg F.
- l. Refrigerant expansion valve and refrigerant types.
- m. Refrigerant suction pressure in psig.
- n. Refrigerant suction temperature in deg F.
- o. Inlet steam pressure in psig.

- G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Fuel type in input data.
 - g. Output capacity in Btu/h.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and rpm.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in inches, and bore.
 - n. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in CFM.
 - b. Entering-air temperature in deg F.
 - c. Leaving-air temperature in deg F.
 - d. Air temperature differential in deg F.
 - e. Entering-air static pressure in inches wg.
 - f. Leaving-air static pressure in inches wg.
 - g. Air static-pressure differential in inches wg.
 - h. Low-fire fuel input in Btu/h.
 - i. High-fire fuel input in Btu/h.
 - j. Manifold pressure in psig.
 - k. High-temperature-limit setting in deg F.
 - l. Operating set point in Btu/h.
 - m. Motor voltage at each connection.
 - n. Motor amperage for each phase.
 - o. Heating value of fuel in Btu/h.
- H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Coil identification.

- d. Capacity in Btu/h.
- e. Number of stages.
- f. Connected volts, phase, and hertz.
- g. Rated amperage.
- h. Airflow rate in CFM.
- i. Face area in sq. ft.
- j. Minimum face velocity in fpm.
2. Test Data (Indicated and Actual Values):
 - a. Heat output in Btu/h.
 - b. Airflow rate in CFM.
 - c. Air velocity in FPM.
 - d. Entering-air temperature in deg F.
 - e. Leaving-air temperature in deg F.
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in CFM.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.

- J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft.
 - g. Indicated airflow rate in CFM.
 - h. Indicated velocity in FPM.
 - i. Actual airflow rate in CFM.
 - j. Actual average velocity in FPM.
 - k. Barometric pressure in psig.
- K. Air-Terminal-Device Reports:
1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft.
 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in CFM.
 - b. Air velocity in FPM.
 - c. Preliminary airflow rate as needed in CFM.
 - d. Preliminary velocity as needed in FPM.
 - e. Final airflow rate in CFM.
 - f. Final velocity in FPM.
 - g. Space temperature in deg F.
- L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.

- d. Coil make and size.
- e. Flowmeter type.
- 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in CFM.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
 - 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in GPM.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
 - 2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in GPM.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in GPM.
 - j. Voltage at each connection.

k. Amperage for each phase.

N. Instrument Calibration Reports:

1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.11 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Construction Manager.
- B. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 3. If the second verification also fails, design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

3.12 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, concealed return located in unconditioned space.
- B. Related Sections:
 - 1. Section 23 07 19 - HVAC Piping Insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.4 MASTICS

- A. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.

2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 4. Color: Aluminum.
- B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 4. Color: White.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for ducts.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
1. Adhesive: As recommended by jacket material manufacturer.
 2. Color: White.
- C. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
1. Factory cut and rolled to size.
 2. Finish and thickness are indicated in field-applied jacket schedules.
 3. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.

4. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
- D. Self-Adhesive Outdoor Jacket: 60-mil- (1.5-mm-) thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with stucco-embossed aluminum-foil facing.

2.9 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Width: 3 inches (75 mm).
 2. Thickness: 6.5 mils (0.16 mm).
 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 1. Width: 2 inches (50 mm).
 2. Thickness: 3.7 mils (0.093 mm).
 3. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.10 SECUREMENTS

- A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
- B. Insulation Pins and Hangers:
 1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
 - b. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
 3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive-backed base with a peel-off protective cover.
 4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
 5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- D. Wire: 0.080-inch (2.0-mm) nickel-copper alloy.

2.11 CORNER ANGLES

- A. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 4. Seal jacket to wall flashing with flashing sealant.

- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
 - 1. Comply with requirements in Section 07 84 00 - Firestopping for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 00 - Firestopping.

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
 5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.

- e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.5 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 07 84 00 - Firestopping.

3.7 FINISHES

- A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 91 00 - Painting.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, concealed return located in unconditioned space.
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.

3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2.2 inches thick and 0.75-lb/cu. ft. nominal density to achieve overall R-6 insulation value when installed.
- B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2.2 inches thick and 0.75-lb/cu. ft. nominal density to achieve overall R-6 insulation value when installed.

3.11 FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ducts and Plenums, Concealed:
 1. Self-Adhesive Outdoor Jacket.

END OF SECTION

SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
1. Chilled-water piping, indoors.
 2. Reheat water piping, indoors.
 3. Condensate drain piping, indoors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 2. Detail insulation application at pipe expansion joints for each type of insulation.
 3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 4. Detail removable insulation at piping specialties.
 5. Detail application of field-applied jackets.
 6. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Block Insulation: ASTM C 552, Type I.
 - 2. Special-Shaped Insulation: ASTM C 552, Type III.
 - 3. Board Insulation: ASTM C 552, Type IV.
 - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 5. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
 - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- F. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).
- C. Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- E. PVC Jacket Adhesive: Compatible with PVC jacket.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.
 - 4. Color: White.

2.4 SEALANTS

- A. Joint Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Permanently flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
 - 4. Color: White or gray.
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 - 4. Color: White.

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.6 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for pipe.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. Adhesive: As recommended by jacket material manufacturer.
 2. Color: White.
 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Self-Adhesive Outdoor Jacket: 60-mil- (1.5-mm-) thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross-laminated polyethylene film covered with stucco-embossed aluminum-foil facing.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Width: 3 inches (75 mm).
 2. Thickness: 11.5 mils (0.29 mm).
 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 1. Width: 2 inches (50 mm).
 2. Thickness: 6 mils (0.15 mm).

3. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

2.9 SECUREMENTS

- A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- C. Wire: 0.062-inch (1.6-mm) soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.

- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 07 84 00 - Firestopping for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 00 - Firestopping.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.
- ### 3.5 INSTALLATION OF POLYOLEFIN INSULATION
- A. Insulation Installation on Straight Pipes and Tubes:
1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- B. Insulation Installation on Pipe Flanges:
 - 1. Install pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
 - 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install mitered sections of polyolefin pipe insulation.
 - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
 - 2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 3. Install insulation to flanges as specified for flange insulation application.
 - 4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
 - 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.7 FINISHES

- A. Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in and Section 09 91 00 - Painting.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.

- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

- C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Chilled Water above 40 Deg F (5 Deg C): Insulation shall be one of the following:
 - 1. Cellular Glass: 2 inches (50 mm) thick.
 - 2. Polyolefin: 1 inch (25 mm) thick.
- B. Reheating-Hot-Water Supply and Return, up to 200 Deg F and Below: Insulation shall be of the following:
 - 1. Polyolefin: 1 inch thick, pipes up to 1-1/4",
 - 2. Cellular Glass: 1-1/2" thick for pipes 1-1/2" and larger.
- C. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):
 - 1. Cellular Glass: 1-1/2 inches (38 mm) thick
 - 2. Polyolefin: 1 inch (19 mm) thick.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. None.
- D. Piping, Exposed:
 - 1. PVC: 30 mils (0.8 mm) thick.

END OF SECTION

SECTION 23 09 00 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

1.2 ACTION SUBMITTALS

- A. Product Data: For each control device indicated.
- B. Shop Drawings:
 - 1. Schematic flow diagrams.
 - 2. Power, signal, and control wiring diagrams.
 - 3. Details of control panel faces.
 - 4. Damper schedule.
 - 5. Valve schedule.
 - 6. DDC System Hardware: Wiring diagrams, schematic floor plans, and schematic control diagrams.
 - 7. Control System Software: Schematic diagrams, written descriptions, and points list.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Software and firmware operational documentation.

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The existing control system is Trane Tracer Ensemble system. All new work must be fully integrated into the Trane Tracer Ensemble system. Room pressure sensors shall be incorporated into Trane Tracer Ensemble system.

2.2 CONTROL SYSTEM

- A. Products: Subject to compliance with requirements, all controls components and programming shall be provided by the following:
 - 1. Trane Tracer Ensemble system.
- B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics. All new graphics will be added to the Tracer Enterprise Server.

2.3 DDC EQUIPMENT

- A. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.
 - 1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation.
 - 2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
 - a. Global communications.
 - b. Discrete/digital, analog, and pulse I/O.
 - c. Monitoring, controlling, or addressing data points.
 - d. Software applications, scheduling, and alarm processing.
 - e. Testing and developing control algorithms without disrupting field hardware and controlled environment.
- B. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.
 - 1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.

2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
 - a. Global communications.
 - b. Discrete/digital, analog, and pulse I/O.
 - c. Monitoring, controlling, or addressing data points.
 3. Local operator interface provides for download from or upload to operator workstation.
- C. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.
1. Binary Inputs: Allow monitoring of on-off signals without external power.
 2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
 3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
 4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation.
 5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
 6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
 7. Universal I/Os: Provide software selectable binary or analog outputs.
- D. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:
1. Output ripple of 5.0 mV maximum peak to peak.
 2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
 3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.
- E. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:
1. Minimum dielectric strength of 1000 V.
 2. Maximum response time of 10 nanoseconds.
 3. Minimum transverse-mode noise attenuation of 65 dB.
 4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.4 UNITARY CONTROLLERS

- A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.
 - 1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
 - 2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
 - 3. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

2.5 ANALOG CONTROLLERS

- A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.
- B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.
- C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.
 - 1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.
- D. Fan-Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

2.6 ELECTRONIC SENSORS

- A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
- B. Thermistor Temperature Sensors and Transmitters:
 - 1. Accuracy: Plus or minus 0.36 deg F at calibration point.
 - 2. Wire: Twisted, shielded-pair cable.
 - 3. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..

4. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft..
 5. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
 6. Room Sensor Cover Construction: Manufacturer's standard locking covers.
 - a. Set-Point Adjustment: Exposed.
 - b. Set-Point Indication: Exposed.
 - c. Temperature display: Exposed.
 - d. Orientation: Vertical or Horizontal.
 7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
 8. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.
- C. RTDs and Transmitters:
1. Accuracy: Plus or minus 0.2 percent at calibration point.
 2. Wire: Twisted, shielded-pair cable.
 3. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
 4. Averaging Elements in Ducts: 18 inches long, rigid; use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.
 5. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
 6. Room Sensor Cover Construction: Manufacturer's standard locking covers.
 - a. Set-Point Adjustment: Exposed.
 - b. Set-Point Indication: Exposed.
 - c. Temperature display: Exposed.
 - d. Orientation: Vertical or Horizontal.
 7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
 8. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.
- D. Humidity Sensors: Bulk polymer sensor element.
1. Accuracy: 2 percent full range with linear output.
 2. Room Sensor Range: 20 to 80 percent relative humidity.
 3. Room Sensor Cover Construction: Manufacturer's standard locking covers.
 - a. Set-Point Adjustment: Exposed.
 - b. Set-Point Indication: Exposed.
 - c. Orientation: Vertical or Horizontal.
 4. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
 5. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of 32 to 120 deg F.

6. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

E. Pressure Transmitters/Transducers:

1. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
 - a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
 - b. Output: 4 to 20 mA.
 - c. Building Static-Pressure Range: 0- to 0.25-inch wg.
 - d. Duct Static-Pressure Range: 0- to 5-inch wg.
2. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
3. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
4. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
5. Pressure Transmitters: Direct acting for gas or liquid service; range suitable for system; linear output 4 to 20 mA.

F. Room Sensor Cover Construction: Manufacturer's standard locking covers.

1. Set-Point Adjustment: Exposed.
2. Set-Point Indication: Exposed.
3. Orientation: Vertical or Horizontal.

2.7 STATUS SENSORS

- A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.
- B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.
- C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.
- D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.
- E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

- F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
- G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
- H. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

2.8 ACTUATORS

- A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
 - 1. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
 - 2. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
 - 3. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
 - 4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
 - 5. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.
- B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
 - 1. Valves: Size for torque required for valve close off at maximum pump differential pressure.
 - 2. Dampers: Size for running torque calculated as follows:
 - a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
 - b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
 - c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft. of damper.
 - d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
 - e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
 - f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.
 - 3. Coupling: V-bolt and V-shaped, toothed cradle.
 - 4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
 - 5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.

6. Power Requirements (Two-Position Spring Return): 24-V ac.
7. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
8. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
9. Temperature Rating: 40 to 104 deg F.
10. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
11. Run Time: 12 seconds open, 5 seconds closed.
12. Manufacturer: Belimo.

2.9 CONTROL VALVES

- A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.
- B. Hydronic system globe valves shall have the following characteristics:
 1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.
 2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
 3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.
 - a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
 - b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.
 4. Sizing: 3-psig maximum pressure drop at design flow rate or the following:
 - a. Two Position: Line size.
 - b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
 5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
 6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.
- C. Butterfly Valves: 200-psig, 150-psig maximum pressure differential, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.
 1. Body Style: Lug or Grooved.
 2. Disc Type: Aluminum bronze.
 3. Sizing: 1-psig maximum pressure drop at design flow rate.

- D. Terminal Unit Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.
 - 1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
 - 2. Sizing: 3-psig maximum pressure drop at design flow rate, to close against pump shutoff head.
 - 3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

- E. Self-Contained Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.
 - 1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
 - 2. Thermostatic Operator: Wax-filled integral sensor with integral adjustable dial.

2.10 DAMPERS

- A. Dampers: AMCA-rated, opposed-blade design; 0.108-inch-minimum thick, galvanized-steel or 0.125-inch-minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch-thick galvanized steel with maximum blade width of 8 inches and length of 48 inches. Provide type 316 stainless steel damper blades where exposed to outside air.
 - 1. Secure blades to 1/2-inch-diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated sintered bronze blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
 - 2. Operating Temperature Range: From minus 40 to plus 200 deg F.
 - 3. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.
 - 4. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.11 CONTROL CABLE

- A. Electronic and fiber-optic cables for control wiring are specified in Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.

- B. ENCLOSURES

- C. Control panels, actuator housings, sensors: NEMA 250, to comply with environmental conditions at installed locations.
 - 1. Indoor, dry and clean locations: Type 1.
 - 2. Outdoor, naturally ventilated or other wet or damp indoor locations: Type 4X, stainless steel. Enclosures for variable frequency drives shall be Type 3R, stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.
 - 1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- B. Install guards on thermostats in the following locations:
 - 1. Entrances.
 - 2. Public areas.
 - 3. Where indicated.
- C. Install automatic dampers according to Section 23 33 00 - Duct Accessories.
- D. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
- E. Install labels and nameplates to identify control components according to Section 23 05 53 - Identification for HVAC And Plumbing Piping and Equipment.
- F. Install hydronic instrument wells, valves, and other accessories according to Section 23 22 16 - Hydronic Piping Specialties.
- G. Install duct volume-control dampers according to Section 23 31 13 - Metal Ducts.
- H. Install electronic and fiber-optic cables according to Section 27 10 00 - Building Telecommunication Cabling System.

3.2 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Section 26 05 33 - Raceway and Boxes for Electrical Systems.
- B. Install building wire and cable according to Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.
- C. Install signal and communication cable according to Section 27 10 00 - Building Telecommunication Cabling System.
 - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
 - 2. Install exposed cable in raceway.
 - 3. Install concealed cable in raceway.
 - 4. Bundle and harness multi-conductor instrument cable in place of single cables where several cables follow a common path.

5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
 6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
 7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
- F. Wireless communication between System Controllers and VAV controllers is acceptable where approved.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
 2. Test and adjust controls and safeties.
 3. Test calibration of controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
 4. Test each point through its full operating range to verify that safety and operating control set points are as required.
 5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
 6. Test each system for compliance with sequence of operation.
 7. Test software and hardware interlocks.
- C. DDC Verification:
1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
 2. Check instruments for proper location and accessibility.
 3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
 4. Check instrument tubing for proper fittings, slope, material, and support.
 5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
 6. Check temperature instruments and material and length of sensing elements.

7. Check control valves. Verify that they are in correct direction.
8. Check DDC system as follows:
 - a. Verify that DDC controller power supply is from emergency power supply, if applicable.
 - b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
 - c. Verify that spare I/O capacity has been provided.
 - d. Verify that DDC controllers are protected from power supply surges.

- D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls.

END OF SECTION

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
 - 1. Chilled water piping
 - 2. Reheat hot-water piping
 - 3. Condensate drain pipe

1.2 ACTION SUBMITTALS

- A. Delegated-Design Submittal:
 - 1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
 - 2. Locations of pipe anchors and alignment guides and expansion joints and loops.
 - 3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
 - 4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Reheat hot-water piping: 150 psig at 200 deg F.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. Grooved, Mechanical-Joint, Wrought-Copper Fittings: ASME B16.22.
 - 1. Grooved-End Copper Fittings: ASTM B 75copper tube or ASTM B 584, bronze casting.
 - 2. Grooved-End-Tube Couplings: Rigid pattern unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, prelubricated EPDM gasket rated for minimum 230 deg. F or use with housing, and steel bolts and nuts.
- D. Wrought-Copper Unions: ASME B16.22.

2.3 PLASTIC PIPE AND FITTINGS

- A. PVC Plastic Pipe: ASTM D1785.
 - 1. PVC Socket Fittings: ASTM D2466 for Schedule 40.
 - 2. PVC Schedule 80 Threaded Fittings: ASTM D2464.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise 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/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- F. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

- G. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.
- H. Solvent Cements for PVC Piping: ASTM D2564. Include primer in accordance with ASTM F656.

2.5 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Plastic-to-Metal Transition Fittings:
 - 1. Description:
 - a. PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket or threaded end.
 - 2. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.
- D. Plastic-to-Metal Transition Unions:
 - 1. Brass or copper end and solvent-cement-joint end of union to match pipe in size and material.
 - 2. Description:
 - a. PVC four-part union.
 - b. Brass or stainless steel threaded end.
 - c. Solvent-cement-joint or threaded plastic end.
 - d. Rubber O-ring.
 - e. Union nut.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Description:
 - a. Standard: ASSE 1079.

- b. Pressure Rating: 150 psig End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be the following:
 - 1. Type L drawn-temper copper tubing, wrought-copper fittings, and soldered or (at contractor's option) pressure-seal joints.
- B. Chilled-Water Piping, Aboveground, NPS 2 (DN 50) and Smaller, to be Any of the Following:
 - 1. Type K or Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.
 - 2. Schedule 40, Grade B steel pipe; Class 125, cast-iron fittings; and threaded or grooved mechanical joints.
- C. Condensate-Drain Piping Installed Aboveground to Be Any of the Following:
 - 1. Type K or Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.
 - 2. Schedule 40, solid wall PVC plastic pipe and drainage pattern fittings and solvent-welded joints.
- D. Air-Vent Piping:
 - 1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
 - 2. Outlet: Type K (Type A), annealed-temper copper tubing with soldered or flared joints.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. 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.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Section 22 05 23.12 - Ball Valves for Plumbing Piping
- Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 23 05 53 - Identification for HVAC and Plumbing Piping and Equipment for identifying piping.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 23 05 17 - Sleeves and Sleeve Seals for Plumbing and HVAC Piping.
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 23 05 17 - Sleeves and Sleeve Seals for Plumbing and HVAC Piping.

- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 05 18 - Escutcheons for Plumbing and HVAC Piping.

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints in accordance with ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.
- D. Brazed Joints: Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Threaded Joints: Thread pipe with tapered pipe threads in accordance with 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.
- F. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. PVC Pressure Piping: Join ASTM D1785 schedule number, PVC pipe, and PVC socket fittings in accordance with ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings in accordance with ASTM D2855.
 3. PVC Nonpressure Piping: Join in accordance with ASTM D2855.
- G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
- H. Plain-End Mechanical-Coupled Joints: Prepare, assemble, and test joints in accordance with manufacturer's written installation instructions.

3.4 INSTALLATION OF DIELECTRIC FITTINGS

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

- B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric nipples or unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges or flange kits or nipples.
- D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.
- C. Install hangers for copper tubing and steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping within 12 inches of each fitting and coupling.
- F. Support vertical runs of copper tubing and steel piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support vertical runs of PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Support vertical runs of fiberglass piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections are to be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

- D. Install ports for pressure gauges and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230500 "Common Work Results for HVAC."

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 230553 "Identification for HVAC Piping and Equipment."

3.8 SYSTEM STARTUP

- A. Perform the following before operating the system:
 1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

3.9 FIELD QUALITY CONTROL

- A. Prepare hydronic piping in accordance with ASME B31.9 and as follows:
 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure is to be capable of sealing against test pressure without damage to valve.
 5. Install pressure-relief valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 1. Use ambient-temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 3. Isolate expansion tanks and determine that hydronic system is full of water.

4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure is not to exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9.
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

END OF SECTION

SECTION 23 21 16 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes special-duty valves and specialties for the following:
 - 1. Chilled water piping.
 - 2. Reheat hot-water piping.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 - 2. Air-control devices.
 - 3. Hydronic specialties.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Reheat hot-water piping: 150 psig at 200 deg F.

2.2 VALVES

- A. Ball Valves: Comply with requirements specified in Section 22 05 23.12 - Ball Valves for Plumbing Piping

- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 23 09 00 - HVAC Instrumentation and Controls.

- C. Bronze, Calibrated-Orifice, Balancing Valves:
 - 1. Body: Bronze, ball or plug type with calibrated orifice or venturi.
 - 2. Ball: Brass or stainless steel.
 - 3. Plug: Resin.
 - 4. Seat: PTFE.
 - 5. End Connections: Threaded or socket.
 - 6. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 - 7. Handle Style: Lever, with memory stop to retain set position.
 - 8. CWP Rating: Minimum 125 psig.
 - 9. Maximum Operating Temperature: 250 deg F.

- D. Automatic Flow-Control Valves:
 - 1. Body: Brass or ferrous metal.
 - 2. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
 - 3. Combination Assemblies: Include bronze or brass-alloy ball valve.
 - 4. Identification Tag: Marked with zone identification, valve number, and flow rate.
 - 5. Size: Same as pipe in which installed.
 - 6. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
 - 7. Minimum CWP Rating: 175 psig.
 - 8. Maximum Operating Temperature: 200 deg F.

2.3 AIR-CONTROL DEVICES

- A. Manual Air Vents:
 - 1. Body: Bronze.
 - 2. Internal Parts: Nonferrous.
 - 3. Operator: Screwdriver or thumbscrew.
 - 4. Inlet Connection: NPS 1/2.
 - 5. Discharge Connection: NPS 1/8.
 - 6. CWP Rating: 150 psig.
 - 7. Maximum Operating Temperature: 225 deg F.

2.4 HYDRONIC PIPING SPECIALTIES

- A. Y-Pattern Strainers:
 - 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
 3. Strainer Screen: Stainless-steel, 40-mesh strainer, or perforated stainless-steel basket.
 4. CWP Rating: 125 psig.
- B. Stainless-Steel Bellow, Flexible Connectors:
1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
 2. End Connections: Threaded or flanged to match equipment connected.
 3. Performance: Capable of 3/4-inch misalignment.
 4. CWP Rating: 150 psig.
 5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves at each branch connection to return main.
- C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
- D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
- F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.2 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

- C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.
- D. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank.
 - 1. Install tank fittings that are shipped loose.
 - 2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.
- E. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:

1. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC for testing, adjusting, and balancing requirements for metal ducts.
2. Section 23 33 00 - Air Duct Accessories for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ANSI/ASHRAE 62.1.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 2. Factory- and shop-fabricated ducts and fittings.

3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.

B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Fabricate round ducts larger Than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 (Z180).
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

- F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- E. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

- B. Hanger Rods for Corrosive Environments (outdoors and ventilated spaces): Stainless steel rods and nuts.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.6 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- C. Restraint Cables: ASTM A 492, stainless-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 33 00 - Air Duct Accessories for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
 - 3. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
 - 4. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 5. Conditioned Space, Return-Air Ducts: Seal Class B.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.

- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with ASCE/SEI 7.
 - 1. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
 - 2. Brace a change of direction longer than 12 feet (3.7 m).
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 23 33 00 - Air Duct Accessories.
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 23 33 00 - Air Duct Accessories for access panels and doors.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 1. Air outlets and inlets (registers, grilles, and diffusers).
 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 4. Coils and related components.
 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.

6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

- A. Air Balance: Comply with requirements in Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

3.9 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
- B. Supply Ducts:
 1. Ducts downstream of a Variable-Air-Volume box or Terminal Unit:
 - a. Pressure Class: Positive 2-inch wg (500 Pa).
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
 2. Ducts upstream of a Variable-Air-Volume box or Terminal Unit:
 - a. Pressure Class: Positive 3-inch wg (750 Pa).
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 3-inch wg (750 Pa).
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative E-inch wg (500 Pa).
 - b. Minimum SMACNA Seal Class: A
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm (5 m/s) or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm (7.6 m/s) or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

- c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.
- G. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity up to 1500 fpm (7.6 m/s): Conical tap.
 - b. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 33 00 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Backdraft and pressure relief dampers.
 2. Manual volume dampers.
 3. Control dampers.
 4. Fire dampers.
 5. Smoke dampers.
 6. Flange connectors.
 7. Turning vanes.
 8. Flexible connectors.
 9. Flexible ducts.
 10. Duct accessory hardware.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control-damper installations.
 - d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
 - e. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Description: Gravity balanced.
- B. Maximum Air Velocity: 1250 fpm.
- C. Maximum System Pressure: 1-inch wg.
- D. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.
- E. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum with sealed edges.
- F. Blade Action: Parallel.
- G. Blade Seals: Felt.
- H. Blade Axles:
 - 1. Material: Stainless steel.

2. Diameter: 0.20 inch.
- I. Tie Bars and Brackets: Galvanized steel.
- J. Return Spring: Adjustable tension.
- K. Bearings: synthetic pivot bushings.
- L. Accessories:
 1. Adjustment device to permit setting for varying differential static pressure.
 2. Counterweights and spring-assist kits for vertical airflow installations.
 3. Electric actuators.
 4. Chain pulls.
 5. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20 gage minimum.
 - b. Sleeve Length: 6 inches minimum.
 6. Screen Mounting: Rear mounted.
 7. Screen Material: Stainless steel.
 8. Screen Type: Bird.
 9. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 1. Standard leakage rating, with linkage outside airstream.
 2. Suitable for horizontal or vertical applications.
 3. Frames:
 - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 4. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 5. Blade Axles: Galvanized steel.
 6. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 7. Tie Bars and Brackets: Galvanized steel.

2.5 FIRE DAMPERS

- A. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- B. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- C. Fire Rating: 1-1/2 hours.
- D. Frame: Multiple-blade type; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.39 inch thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.024-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.
- H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- I. Heat-Responsive Device: Electric, resettable link and switch package, factory installed, 165 deg F rated.

2.6 SMOKE DAMPERS

- A. General Requirements: Label according to UL 555S by an NRTL.
- B. Smoke Detector: Integral, factory wired for single-point connection.
- C. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.
- D. Blades: Roll-formed, horizontal, interlocking, 0.034-inch-thick, galvanized sheet steel.
- E. Leakage: Class II.
- F. Rated pressure and velocity to exceed design airflow conditions.
- G. Mounting Sleeve: Factory-installed, 0.05-inch-thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- H. Damper Motors: Two-position action.

- I. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 23 09 00 - HVAC Instrumentation and Controls.
 - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 - 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 - 7. Electrical Connection: 115 V, single phase, 60 Hz.
- J. Accessories:
 - 1. Auxiliary switches for signaling.
 - 2. Test and reset switches, remote mounted.
 - 3. Integral duct smoke detector, ionization type.

2.7 FLANGE CONNECTORS

- A. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.

2.8 TURNING VANES

- A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

- C. Vane Construction: Single wall.

2.9 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.

2.10 FLEXIBLE DUCTS

- A. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 20 to plus 210 deg F.
 - 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- B. Flexible Duct Connectors:
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
 - 2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.11 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream and downstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 7. At each change in direction and at maximum 50-foot spacing.
 - 8. Upstream from turning vanes.
 - 9. Upstream or downstream from duct silencers.
 - 10. Control devices requiring inspection.

11. Elsewhere as indicated.

- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body plus Ladder Access: 25 by 17 inches.
- K. Label access doors according to Section 23 05 53 - Identification for HVAC and Plumbing Piping and Equipment to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- N. Connect flexible ducts to metal ducts with draw bands.
- O. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Modulating, single-duct air terminal units.
 2. Casing liner.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of air terminal unit.
- B. Shop Drawings: For air terminal units.
1. Include plans, elevations, sections, and mounting details.
 2. Include details of equipment 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.
 4. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.
- C. Delegated Design Submittal: For vibration isolation and supports, and seismic restraints indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Materials, fabrication, assembly, and spacing of hangers and supports.
 2. Design Calculations: Calculate requirements for selecting vibration isolators, supports, and seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, drawn to scale, indicating the items described in this Section, and coordinated with all building trades.
- B. Seismic Qualification Data: For air terminal units, accessories, and components, from manufacturer.
- C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MODULATING, SINGLE-DUCT AIR TERMINAL UNITS

- A. Description: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
- B. Casing: Minimum 20-gauge- thick galvanized steel.
 - 1. Casing Liner: Comply with requirements in "Casing Liner" Article below.
 - 2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
 - 3. Air Outlet: S-slip and drive connections.
 - 4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
- C. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
 - 1. Maximum Damper Leakage: AHRI 880 rated, 1 percent of nominal airflow at 3-inch wg inlet static pressure.
- D. Velocity Sensors: Multipoint array with velocity inlet sensors.
- E. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch. Include manual air vent and drain valve. Provide hydronic heating coils for air terminal units scheduled on Drawings.
- F. Direct Digital Controls:
 - 1. Terminal Unit Controller: Pressure-independent, VAV controller and integrated actuator, and electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes.
 - a. Occupied and unoccupied operating mode.
 - b. Remote reset of airflow or temperature set points.
 - c. Adjusting and monitoring with portable terminal.
 - d. Communication with temperature-control system specified in Section 23 09 23 - Direct Digital Control (DDC) System for HVAC.
 - 2. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.
 - 3. Terminal Unit Controller, Section 23 09 23: Controller is to be factory mounted and wired by air terminal manufacturer; unit controllers, integrated actuators, and room sensors to be furnished under Section 23 09 23 - Direct Digital Controls (DDC) for HVAC.

- G. Control Sequence: See Control Diagram on mechanical drawing for control sequences.

2.2 CASING LINER

- A. Casing Liner, Fibrous Glass: Fibrous-glass duct liner, complying with ASTM C1071, NFPA 90A or NFPA 90B, and with NAIMA AH124.
 - 1. Minimum Thickness: 1 inch.
 - a. Maximum Thermal Conductivity:
 - 1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 2. Provide with double wall construction to avoid fiberglass in air stream.
 - 3. Solid Metal Liner: Solid galvanized sheet metal encapsulating matted insulation face from airstream.
 - 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.

2.3 SOURCE QUALITY CONTROL

- A. AHRI 880 Certification: Test, rate, and label assembled air terminal units in accordance with AHRI 880.
- B. Water Coils: Factory pressure test to 300 psig in accordance with AHRI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment and Section 23 31 13 - Metal Ducts for hangers and supports.
- B. Install air terminal units according to NFPA 90A.
- C. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
- D. Install wall-mounted thermostats.

3.2 PIPING CONNECTIONS

- A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.

- B. Hot-Water Piping: Comply with requirements in Section 23 21 13 - Hydronic Piping and Section 23 21 16 - Hydronic Piping Specialties and connect heating coils to supply piping with shutoff valve, strainer, control valve, and union or flange; and to return piping with balancing valve and union or flange.

3.3 DUCTWORK CONNECTIONS

- A. Comply with requirements in Section 23 31 13 - Metal Ducts for connecting ducts to air terminal units.
- B. Make connections to air terminal units with flexible connectors complying with requirements in Section 23 33 00 - Air Duct Accessories.

3.4 ELECTRICAL CONNECTIONS

- A. Install field power to each air terminal unit electrical power connection. Coordinate with air terminal unit manufacturer and installers.
- B. Connect wiring in accordance with Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- C. Ground equipment in accordance with Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- E. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 26 05 53 - Identification for Electrical Systems.
 - 2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.5 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 26 05 23 - Control-Voltage Electrical Power Cables.

3.6 IDENTIFICATION

- A. Label each air terminal unit with drawing designation, nominal airflow, maximum and minimum factory-set airflows, and coil type. Comply with requirements in Section 22 05 53 - Identification for HVAC Piping and Equipment for equipment labels and warning signs and labels.

3.7 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 - 2. Verify that inlet duct connections are recommended by air terminal unit manufacturer to achieve proper performance.
 - 3. Verify that controls and control enclosure are accessible.
 - 4. Verify that control connections are complete.
 - 5. Verify that nameplate and identification tag are visible.
 - 6. Verify that controls respond to inputs as specified.

3.8 ADJUSTING

- A. Comply with requirements in Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC for air terminal unit testing, adjusting, and balancing.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Air terminal unit will be considered defective if it does not pass tests and inspections.

- D. Prepare test and inspection reports.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION

SECTION 23 37 13.13 - AIR DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Louver face diffusers.
2. Registers and grilles.
3. Adjustable Bar Grille.
4. Linear slot diffusers.

B. Related Requirements:

1. Section 23 33 00 - Air Duct Accessories for fire and smoke dampers and volume-control dampers not integral to diffusers.
2. Section 23 37 13.23 - Air Registers and Grilles for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 LOUVER FACE DIFFUSERS

- A. Devices shall be specifically designed for variable-air-volume flows.
- B. Material: Aluminum.
- C. Finish: Baked enamel, white.
- D. Face Size: 24 by 24 inches (600 by 600 mm) or other size as shown on drawings.
- E. Mounting: T-bar.
- F. Pattern: Four-way core style.
- G. Dampers: Combination damper and grid.
- H. Accessories:
1. Square to round neck adaptor.
 2. Adjustable pattern vanes.

3. Throw reducing vanes.
4. Equalizing grid.
5. Plaster ring.
6. Safety chain.
7. Wire guard.
8. Sectorizing baffles.
9. Operating rod extension.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Material: Aluminum.
2. Finish: Baked enamel, white.
3. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
4. Core Construction: Integral.
5. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
6. Frame: 1 inch wide.
7. Mounting Frame: None.
8. Mounting: Countersunk screw.
9. Damper Type: Adjustable opposed blade.
10. Accessories:
 - a. Rear-blade gang operator.

B. Adjustable Bar Grille:

1. Material: Aluminum.
2. Finish: Baked enamel, white.
3. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
4. Core Construction: Integral.
5. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
6. Frame: 1 inch wide.
7. Mounting Frame: None.
8. Mounting: Countersunk screw.

2.3 LINEAR SLOT DIFFUSERS

A. Devices shall be specifically designed for variable-air-volume flows.

1. Material - Shell: Aluminum.
2. Material - Pattern Controller and Tees: Aluminum.
3. Finish - Face and Shell: Baked enamel, black.
4. Finish - Pattern Controller: Baked enamel, black.
5. Finish - Tees: Baked enamel, white.

6. Slot Width: Refer to drawings.
7. Number of Slots: Refer to drawings.
8. Length: Refer to drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 73 13.13 - INDOOR, BASIC AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes factory-assembled, indoor air-handling units with limited features, including the following components and accessories:
 - 1. Casings.
 - 2. Fans, drives, and motors.
 - 3. Coils.
 - 4. Air filtration.
 - 5. Dampers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each air-handling unit.
- B. Shop Drawings: For each type and configuration of indoor, basic, air-handling unit.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Detail fabrication and assembly of indoor, basic air-handling units, as well as procedures and diagrams.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Delegated Design Submittal: For vibration isolation, supports, and seismic restraints indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Design Calculations: Calculate requirements for selecting vibration isolators, supports, and seismic restraints and for designing vibration isolation bases.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

- B. Seismic Qualification Data: Certificates for indoor, basic air-handling units, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4. Restraint of internal components.
- C. Source quality-control reports.
- D. Startup service reports.
- E. Field quality-control reports.
- F. Sample Warranty: For manufacturer's warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.5 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace components of indoor, basic, air-handling units that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Manufacturer's standard, but not less than one year(s) from date of unit startup.

PART 2 - PRODUCTS

2.1 UNIT CASINGS

- A. General Fabrication Requirements for Casings;
 - 1. Forming: Form walls, roofs, and floors with at least two breaks at each joint.
 - 2. Joints: Sheet metal screws or pop rivets.
 - 3. Sealing: Seal all joints with water-resistant sealant. Hermetically seal at each corner and around entire perimeter.
 - 4. Base Rail:
 - a. Material: Galvanized steel.
 - b. Height: 4 inches.

- B. Double-Wall Construction:
 - 1. Outside Casing Wall: Galvanized steel, minimum 18 gauge thick, with manufacturer's standard finish.
 - 2. Inside Casing Wall: G90 galvanized steel, solid, minimum 18 gauge thick.
 - 3. Floor Plate: G90 galvanized steel, minimum 18 gauge thick.
 - 4. Casing Insulation:
 - a. Materials: injected polyurethane foam insulation.
 - b. Casing Panel R-Value: Minimum 6.5.
 - c. Insulation Thickness: 1 inch.
 - d. Thermal Break: Provide continuity of insulation with no through-casing metal in casing walls, floors, or roofs of air-handling unit.
- C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.
- D. Static-Pressure Classifications:
 - 1. For Unit Sections Upstream of Fans: Minus 2-inch wg.
 - 2. For Unit Sections Downstream and Including Fans: 2-inch wg.
- E. Panels and Doors:
 - 1. Panels:
 - a. Fabrication: Formed and reinforced with same materials and insulation thickness as casing.
 - b. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against airflow.
 - c. Gasket: Neoprene, applied around entire perimeters of panel frames.
 - d. Size: Large enough to allow unobstructed access for inspection and maintenance of air-handling unit's internal components. At least 18 inches wide by full height of unit casing up.
 - 2. Doors:
 - a. Fabrication: Formed and reinforced with same materials and insulation thickness as casing.
 - b. Hinges: A minimum of two ball-bearing hinges or stainless-steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against airflow. Provide safety latch retainers on doors so that doors do not open uncontrollably.
 - c. Gasket: Neoprene, applied around entire perimeters of frame.
 - d. Size: Large enough to allow for unobstructed access for inspection and maintenance of air-handling unit's internal components. At least 18 inches wide by full height of unit casing up.
 - 3. Locations and Applications:
 - a. Fan Section: Doors.
 - b. Coil Section: Panels.

- c. Filter Section: Doors large enough to allow periodic removal and installation of filters.

F. Condensate Drain Pans:

1. Location: Each type of cooling coil.
2. Construction:
 - a. Stainless-steel sheet.
3. Drain Connection:
 - a. Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
 - b. Minimum Connection Size: NPS 1.
4. Slope: Minimum 0.125 in./ft. slope, to comply with ASHRAE 62.1, in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers, and to direct water toward drain connection.
5. Length: Extend drain pan downstream from leaving face for distance to comply with ASHRAE 62.1.
6. Width: Entire width of water producing device.
7. Depth: A minimum of 2 inches deep.

2.2 FAN, DRIVE, AND MOTOR SECTION

- A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.
- B. Fans: Centrifugal, galvanized steel; mounted on solid-steel shaft.
 1. Shafts: With field-adjustable alignment.
 - a. Turned, ground, and polished hot-rolled steel with keyway.
 2. Shaft Bearings:
 - a. Heavy-duty, self-aligning, pillow-block type with an L-50 rated life of minimum 100,000 hours according to ABMA 9.
 3. Housings: Formed- and reinforced-steel panels to form curved scroll housings with shaped cutoff and spun-metal inlet bell.
 - a. Bracing: Steel angle or channel supports for mounting and supporting fan scroll, wheel, motor, and accessories.
 4. Plenum Fans: Steel frame and panel; fabricated without fan scroll and volute housing. Provide inlet screens for Type SWSI fans.
 5. Airfoil, Centrifugal Fan Wheels (Plenum Fan Wheels): Smooth-curved inlet flange, backplate, and hollow die-formed airfoil-shaped blades continuously welded at tip flange and backplate; steel hub riveted to backplate and fastened to shaft with setscrews.
 6. Mounting: For internal vibration isolation. Factory-mount fans with manufacturer's standard restrained vibration isolation mounting devices.

7. Shaft Lubrication Lines: Extended to a location outside the casing.
 8. Flexible Connector: Factory fabricated with a fabric strip minimum 3-1/2 inches wide, attached to two strips of minimum 2-3/4-inch-wide by 0.028-inch-thick, galvanized-steel sheet.
 - a. Flexible Connector Fabric: Glass fabric, double coated with neoprene. Fabrics, coatings, and adhesives shall comply with UL 181, Class 1.
- C. Drive, Direct: Factory-mounted, direct drive.
- D. Motors:
1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 3. Enclosure Type: Open drip proof (ODP) or totally enclosed fan cooled (TEFC).
 4. Enclosure Materials: Cast iron.
 5. Efficiency: Premium efficient as defined in NEMA MG 1.
 6. NEMA Design: MG1.
 7. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
- E. Variable-Frequency Motor Controller: Serving each fan individually in fan array.
1. Manufactured Units: Pulse-width modulated; constant torque for inverter-duty motors.
 2. Output Rating: Three-phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.
 3. Unit Operating Requirements:
 - a. Internal Adjustability:
 - 1) Minimum Speed: 5 to 25 percent of maximum rpm.
 - 2) Maximum Speed: 80 to 100 percent of maximum rpm.
 - 3) Acceleration: 0.1 to 999.9 seconds.
 - 4) Deceleration: 0.1 to 999.9 seconds.
 - 5) Current Limit: 30 to minimum of 150 percent of maximum rating.
 - b. Self-Protection and Reliability Features:
 - 1) Surge suppression.
 - 2) Loss of input signal protection.
 - 3) Under- and overvoltage trips.
 - 4) Variable-frequency motor controller and motor-overload/overtemperature protection.
 - 5) Critical frequency rejection.
 - 6) Loss-of-phase protection.
 - 7) Reverse-phase protection.

- 8) Motor-overtemperature fault.
- c. Bidirectional autospeed search.
- d. Torque boost.
- e. Motor temperature compensation at slow speeds.
 - 1) Panel-mounted operator station.
 - 2) Historical logging information and displays.
 - 3) Digital indicating devices.
- f. Control Signal Interface: Electric.
- g. Proportional Integral Directive (PID) control interface.
- h. DDC system for HVAC Protocols for Network Communications: ASHRAE 135.
- 4. Line Conditioning:
 - a. Input line conditioning.
 - b. Output filtering.
 - c. EMI/RFI filtering.

2.3 COIL SECTION

- A. General Requirements for Coil Section:
 - 1. Comply with AHRI 410.
 - 2. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
 - 3. Coils shall not act as structural component of unit.
- B. Cooling Coils:
 - 1. Chilled-Water Coil: Continuous circuit.
 - a. Piping Connections: Threaded or Flanged, same end of coil.
 - b. Tube Material: Copper.
 - c. Tube Thickness: 0.020 inches.
 - d. Fin Type: Plate.
 - e. Fin Material: Aluminum.
 - f. Fin Thickness: 0.0075 inches.
 - g. Fin and Tube Joint: Mechanical bond.
 - h. Headers:
 - 1) Cast iron with cleaning plugs and drain and air vent tappings.
 - 2) Seamless copper tube with brazed joints, prime coated.
 - 3) Fabricated steel, with brazed joints, prime coated.
 - 4) Provide insulated cover to conceal exposed outside casings of headers.
 - i. Frames: Channel frame, minimum 0.052-inch- thick galvanized steel.
 - j. Working-Pressure Ratings: 200 psig.

2.4 AIR FILTRATION SECTION

- A. Particulate air filtration is specified in Section 234100 "Particulate Air Filtration."
- B. Panel Filters:
 - 1. Description: Flat, Pleated factory-fabricated, self-supported disposable air filters with holding frames. Refer to schedule for the required MERV rating.
 - 2. Filter Unit Class: UL 900.
 - 3. Media: Interlaced glass, synthetic, or cotton fibers coated with nonflammable adhesive and antimicrobial coating.
 - 4. Filter-Media Frame: High wet-strength beverage board.
- C. Side-Access Filter Mounting Frames:
 - 1. Particulate Air Filter Frames: Match inner casing and outer casing material, and insulation thickness. Galvanized steel track.
 - a. Sealing: Incorporate positive-sealing device to ensure seal between gasketed material on channels to seal top and bottom of filter cartridge frames to prevent bypass of unfiltered air.

2.5 MATERIALS

- A. Steel:
 - 1. ASTM A36/A36M for carbon structural steel.
 - 2. ASTM A568/A568M for steel sheet.
- B. Stainless Steel:
 - 1. Manufacturer's standard grade for casing.
 - 2. Manufacturer's standard type, ASTM A240/A240M for bare steel exposed to airstream or moisture.
- C. Galvanized Steel: ASTM A653/A653M.
- D. Aluminum: ASTM B209.

2.6 SOURCE QUALITY CONTROL

- A. AHRI 430 Certification: Test, rate, and label air-handling units and their components in accordance with AHRI 430.
- B. AHRI 260 or AMCA 311 Sound Performance Rating Certification: Test, rate, and label in accordance with AHRI 260 or AMCA 311.
- C. Fan Aerodynamic Performance Rating: Factory test and rate fan performance for airflow, pressure, power, air density, rotation speed, and efficiency in accordance with AMCA 210.

- D. Fan Energy Index (FEI): Test in accordance with AMCA 210 and rate in accordance with AMCA 99, AMCA 207, and AMCA 208.
- E. Fan Operating Limits: Classify fans in accordance with AMCA 99, Section 14.
- F. Water Coils: Factory tested to 300 psig (2070 kPa) according to AHRI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Examine roughing-in for steam, hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.
- B. Equipment Mounting:
 - 1. Install air-handling units on cast-in-place concrete equipment bases. Coordinate sizes and locations of concrete bases with actual equipment provided. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- C. Suspended Units: Suspend and brace units from structural-steel support frame using threaded steel rods and spring hangers. Coordinate sizes and locations of structural-steel support members with actual equipment provided. Comply with requirements for vibration isolation devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- D. Arrange installation of units to provide access space around air-handling units for service and maintenance.
- E. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.
- F. Connect duct to air-handling units with flexible connections. Comply with requirements in Section 233300 "Air Duct Accessories."

3.2 PIPING CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to air-handling unit, allow for service and maintenance.
- C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

- D. Connect condensate drain pans using ASTM B88, Type M copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- E. Chilled-Water Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

3.3 ELECTRICAL CONNECTIONS

- A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
 - 2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup check according to manufacturer's written instructions.
 - 2. Verify that shipping, blocking, and bracing are removed.
 - 3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
 - 4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.

5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
6. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
7. Comb coil fins for parallel orientation.
8. Verify that proper thermal-overload protection is installed for electric coils.
9. Install new, clean filters.
10. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.
- C. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 CLEANING

- A. After completing system installation and testing, adjusting, and balancing of air-handling unit and air-distribution systems, and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.
 - 2. Charge refrigerant coils with refrigerant and test for leaks.
 - 3. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Air-handling unit and components will be considered defective if unit or components do not pass tests and inspections.
 - 5. Prepare test and inspection reports.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF SECTION

DIVISION 26

ELECTRICAL

DIVISION 26 – ELECTRICAL

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. As specified in SECTION 00 70 00.

1.2 WORK DESCRIPTION

- A. Section Includes: Basic electrical requirements specifically applicable to DIVISION 26 – ELECTRICAL sections in addition to DIVISION 01 – GENERAL REQUIREMENTS sections.

1.3 SYSTEM DESCRIPTION

- A. Furnish all labor and materials required to complete all electrical work as indicated on the drawings and/or specified herein. In general, the following work is included:
1. Removal of existing electrical equipment, devices, light fixtures, raceway and wire as indicated.
 2. Power systems; including branch circuits, outlets, wiring devices, panelboards, raceways, and wiring.
 3. Telecommunication Systems; including raceways, boxes, CAT6 low voltage cabling, cable supports (cable trays), CAT6 couplers, faceplates, and patch panels.
 4. Fire alarm system; including raceways, boxes, equipment, devices, and low voltage cabling.
 5. Nurse call system; including raceways, boxes, equipment, devices, and low voltage cabling.
 6. Installation of power to equipment furnished by Owner or by others, including the furnishing of disconnects.
 7. Coordination of power to medical equipment furnished by others.
 8. All necessary firestopping, coring, blocking, and patching of walls and floors as required.
 9. Submittal of product data and shop drawings as specified in SECTION 26 05 10 - BASIC ELECTRICAL REQUIREMENTS.
 10. Preparation of “as-built” drawings as specified in SECTION 26 05 10 – BASIC ELECTRICAL REQUIREMENTS.
- B. The term “wiring” shall include raceways, outlets, conductors, fixtures, devices, and panelboards.
- C. Wiring and connecting all electrical equipment supplied for installation and use in this contract and not specifically listed as work by others.

1.4 RULES, STANDARDS, AND PERMITS

- A. The entire work shall comply as specified in SECTION 26 05 10 – BASIC ELECTRICAL REQUIREMENTS.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with SECTION 01 33 00 – SUBMITTAL PROCEDURES and SECTION 26 05 10 – BASIC ELECTRICAL REQUIREMENTS.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Materials and equipment shall be new and those listed by Underwriters' Laboratories shall bear "UL" label of approval. Brand names, manufacturer's names and catalog numbers indicate standards of design and quality required.
- B. Raceways:
 - 1. Rigid steel, zinc-coated, 3/4 inch minimum diameter, except as noted. Other sizes to conform to NEC Chapter 9, Table 3A, based on RHW wires.
 - 2. Electrical metallic tubing (EMT) galvanized round bore with set screw connectors, 3/4 inch minimum diameter, other sizes to conform to NEC Chapter 9, Table 3A, based on RHW wires.
 - 3. Intermediate metal conduit: Steel conduit, zinc coated inside and outside with additional silicone epoxy-ester lubricating coating inside, 3/4 inch minimum diameter.
 - 4. Flexible steel conduit: Galvanized steel, neoprene jacketed for wet locations. Continuous single strip 5' maximum, galvanized 3/4 inch minimum diameter or larger for luminaire connection. (Use for connections to equipment subject to vibration only.)
 - 5. MC type cable is not allowable.

2.2 ELECTRIC SERVICE SYSTEM

- A. Voltages:
 - 1. Service voltage: 480/277 volts, 3-phase, 4-wire and 208/120 volts, 3-phase, 4-wire.
 - 2. Utilization voltages:
 - a. 480/277 volts, 3-phase, 4-wire, solidly grounded.
 - b. 208/120 volts, 3-phase, 4-wire, solidly grounded.
- B. Work Under This Contract:
 - 1. Extend service from existing switchboards.
 - 2. Sleeves, as required, for service entrance raceways.
 - 3. Assure that equipment selected will fit spaces allocated for the equipment and provide equipment that will fit spaces allotted prior to ordering equipment.

C. Fittings and Accessories:

1. Raceway fittings:

- a. Rigid conduit; steel or malleable iron, galvanized. Zinc die cast fittings; not permitted.
- b. EMT; set screw type, steel or malleable iron.
- c. Flexible metallic conduit; angle wedge type with insulated throat.
- d. Bushings; metallic insulated type. Weatherproof or dust-tight installations; liquid-tight with sealing ring and insulated throat.
- e. Expansion and deflection fittings; O.Z./Gedney Type "DX" or accepted equal.

2. Sleeves:

- a. Exterior non-membrane waterproofed walls; galvanized cast iron, galvanized steel or wrought iron with continuously welded center flange.
- b. Exterior membrane waterproof walls, floors and roofs; galvanized cast iron, flashing flange and clamping ring. Similar to Josam 1870 Series.
- c. Exterior non-membrane waterproof roofs; galvanized cast iron, flashing flange and clamping ring. Similar to Josam 1830 Series.
- d. Locations: As indicated, where required and accessible.
- e. Outdoors and damp locations; galvanized cast iron or aluminum with threaded hubs and gaskets.
- f. Provide barriers between wiring energized from different systems; 120/208, 277/480 volt wiring, and emergency and normal wiring.

D. Cable Accessories: All conductor and cable sizes specified herein and indicated on drawings are based on copper type conductors or cables.

1. Cable supports in risers; clamping device with insulation wedges or "Kellems" grips.

2. Tags:

- a. Flameproof linen or fiber in accessible locations.
- b. Feeders: Indicate number, size, phase and points of origin and terminations. Control or alarm: Indicate type of controls or alarm and points of origin and terminations with Brady wire markers in all junction boxes, cabinets, and equipment.

3. Terminations, splices and tapes:

- a. Copper conductors No. 10 and smaller: Compression type connectors and clear nylon insulated covering.
- b. Copper conductors No. 8 and larger: Hydraulic compression type using manufacturers recommended tooling.
- c. Cable lugs and connectors: Compression type of same metal as conductor to match cables with marking indicating size and type.
- d. For copper lug connections to bus bars provide anti-seize compound.

E. Conductors shall be delivered to site in original factory packages or reels. Conductors shall be copper, #12 AWG minimum. Aluminum conductors are prohibited. No. 10 and No. 12 wires shall be solid conductor.

1. Interior locations: Branch circuits, Type RHW, TW, THW or THWN.
2. In gutters and feeders: #6 AWG and larger. Type THW or XHHW.

3. Color coding: As per Code. Where color-coded insulation is unavailable, overlap color taping.
- F. Boxes:
1. Outlet and small junction boxes shall be zinc-coated pressed steel of ample size. Light outlets shall be fitted with no-bolt type fixture studs as necessary for fixture support. Minimum size of power outlet boxes, 4-inch square or octagon.
 2. Extension or raised rings for pressed boxes pressed from NEC gauge steel and galvanized.
 3. Large junction boxes and covers shall be zinc-coated. Screws for cover shall be brass.
 4. Provide all boxes in finished walls with plaster rings. Provide plaster ring and finish blank device plates for all small flush junction boxes.
- G. Wiring Devices: Hospital grade unless otherwise noted.
1. Receptacles, duplex 3-wire, 20 amperes, 125 volts, grounding type, hospital grade, Hubbell Style Line HBL2182WA.
 2. Ground fault circuit interrupting (GFCI) receptacles, duplex 3-wires, 20 amperes, 125 volts, hospital grade, Hubbell GFR 8300HWL.
- H. Device and Cover Plates: White Stainless steel style line decorator.
- I. Disconnect Switches:
1. Non-fused or fused as indicated.
 2. Voltage: 250 volts rated on 120/208 volt circuits and 600 volts rated on 277/480 volt circuits.
 3. Heavy-duty, quick-make quick-break.
 4. Horsepower rated for motor loads.
 5. Toggle type switches as follows:
 6. NEMA 1 indoors; NEMA 3R outdoors.
 - a. Non-fused, load break.
 - b. Maximum ratings: 20 amp at 600 volts and 30 amp at 250 volts.
 7. Knife blade type switches:
 - a. Load breaks type with arc quenchers.
 - b. Maximum rating: 800 amp at 600 volts.
 - c. Manufacturer: Eaton Cutler-Hammer or approved equal.
- J. Circuit Breakers: Molded Case:
1. Thermal-magnetic, 400 amp frame and below; solid state, 600 amp frame and above, bolt-on, quick-make quick-break for both types.
 2. Manually operated with insulated trip free handle and rated for switching duty.
 3. Multi-pole types: With internal trip bar.
 4. Terminals: Suitable for copper.
 5. Auxiliary devices as indicated.
 6. Enclosures: Dead front, NEMA Type I for indoors and NEMA 3R for exteriors, except as noted.

7. Frames as indicated, interchangeable trips and interrupting capacity not less than noted available symmetrical short circuit current.
 8. Manufacturer: Eaton Cutler-Hammer or approved equal.
- K. Hardware, Supports, Backing, Etc.: Provide all hardware, supports, backing and other accessories necessary to install electrical equipment. Wood materials to be termite-resistant. Ferrous material shall be galvanized for corrosion protection. Non-ferrous materials shall be brass or bronze.
- L. Identification:
1. Properly identify all panelboards, cabinets, safety switches, circuit breakers, starters, relays, contactors and other apparatus by attaching engraved phenolic labels to the face of the enclosure. Attachment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates shall not be used.
 2. Plates: All cover and device plates shall be furnished with engraved or etched designations under any one of the following conditions:
 - a. Switches in locations where the equipment or circuits controlled cannot be readily seen.
 - b. Manual motor starting switches.
 - c. Where so indicated on the drawings.
 - d. Where receptacles are other than standard duplex receptacles to indicate voltage and phase.
 3. Provide updated type written directories for all panelboards. Replace existing directories with new type written directories clearly indicating all branch circuits.

PART 3 – EXECUTION

3.1 CONSTRUCTION METHODS

- A. Comply with local ordinances and regulations of the City. Workmanship subject to approval of Architect who shall be afforded every opportunity to determine skill and competency. Concealed work re-opened at random during formal inspection by Architect without additional charge to the Owner.
- B. Construction shall conform to construction practices as recommended by American Electricians Handbook by Croft (latest edition), Edison Electric Institute, National Electrical Code 2020 edition, National Electrical Safety Code and applicable instructions of manufacturers of equipment and materials supplied for project.
- C. Raceways:
1. All conduits within building shall be rigid steel conduits, intermediate metal conduit or electrical metallic tubing. Electrical metallic tubing may be used only in dry walls and above dry ceilings. Paint steel conduits in or under ground floor slabs with asphaltic corrosion resistance base paint or compound after installation in place.
 2. Cut raceways square, and ream inner edges. Butt together evenly in couplings.

3. Make bends and offsets with hickey or conduit bending machine. Do not use vise or pipe tee. Bends made so that interior cross-sectional area will not be reduced. Radius of curve of inner edge will not be reduced. Radius of curve of inner edge of field bend not less than 10 times internal diameter of raceway. Use of running threads not permitted. Where raceways cannot be joined by standard threaded couplings, use approved watertight raceway unions.
 4. Cap raceways during construction with plastic or metal-capped bushings to prevent entrance of dirt or moisture. Swab all raceways out and dry before wires or cables are pulled in.
 5. Mount raceway free from other piping, valves, or mechanical equipment.
 6. Fish wires, free from other piping, valves, or mechanical equipment.
 7. Install insulating bushings and two locknuts on each end of every run of conduit at enclosures and boxes. Provide grounding bushings as required to grounding receptacles and connect conduits to service ground, per NEC Article 250.
 8. Project adequate number of conduit threads through box for bushings.
 9. Run exposed raceways parallel with, or at right angles to structural or architectural elements.
 10. Securely fasten raceways with galvanized pipe straps with screws or bolts and spaced not more than 7 feet apart, as conditions require. Vertical runs supported at intervals not exceeding 5 feet by approved clamp hangers. Conduit runs with one 90-degree bends or equivalent, 140 feet maximum without pullbox. Conduit runs with two 90-degree bends or equivalent, 100 feet maximum without pullbox. Support raceways from structure. Do not support from or on mechanical pipes, ducts or ceiling suspension wires.
 11. After cables have been installed, seal all ducts with mastic compound to prevent entry of water from ductline to termination of ducts in areas below grade.
 12. Install #10 gauge galvanized steel pull wire or nylon line with 200 pound tensile strength in all empty raceways.
 13. All raceway penetrations through fire rated assemblies shall be fire stopped with the appropriate fire rated material.
- D. Outlet Boxes: Provide outlet boxes to suit conditions encountered. Provide outlet boxes in spaces with extension or raised rings of such depth that metal will be flush with surrounding surfaces of opening. When 2 or more switches are installed at single location, mount in gang box under single device plate. Use gang boxes wherever 3 or more switches are installed at one location. Concealed boxes shall be pressed steel, galvanized, 4" square by 1 1/2" deep minimum.
- E. Junction and Pull Boxes:
1. Location: Clear of other work. Conceal junction and pull boxes in finished spaces and maintain accessibility.
 2. Support from building structure, independent of conduit. Do not support to ceiling systems.
 3. Outlet boxes for fixtures recessed in hung ceiling; accessible through opening created by removal of fixture.
 4. Motor terminal boxes: Coordinate with motor branch circuit conduit and wiring.

- F. Installation of Motor Controllers:
1. Determine exact controller locations of individually mounted controllers.
 2. Mount individual controllers on walls, columns or angle steel framework as indicated on drawings, as required.
- G. Conductor fill in raceways shall conform to NEC Chapter 9, Table 5 (based on Type RHW wires) unless otherwise indicated on the drawings.
- H. Wire Pulling: Mechanical means for pulling shall be torque-limiting type and used for #2 AWG and smaller wires. Pulling tension shall not exceed wire manufacturer's recommendations. Lubricants used for wire pulling in all areas except as noted shall be such that it will not damage conductor insulation or sheathing. For neoprene jacketed and plastic-sheathed conductors, use powdered soapstone.
- I. Wire Splicing:
1. Form wires neatly in enclosures and boxes.
 2. Splice in accordance with NEC Article 110. Crimp connect conductors #10 and smaller. Splice conductors #8 through #4/0 with high-pressure compression (indent) copper sleeve connectors. Do not use bolt-on connectors. Reinsulate splices and waterproof splices. Reinsulate splices according to wire manufacturer's instructions. Splice insulation shall be 200 percent in thickness of original wire insulation and of same electrical and mechanical characteristics. Tape shall be 7 mil minimum thickness vinyl plastic.
- J. Grounding:
1. Motors, metallic enclosures, raceways and electrical equipment grounded according to requirements of National Electrical Code, Article 250. Ground connection to equipment, raceways, motors, grounding type receptacles and other metallic parts directly exposed to ungrounded electric conductors by continuous metal raceways, or No. 14 AWG minimum, AWG copper, NEC type TW, green insulated. Install ground wire in all raceways size in accordance with NEC.
 2. All ground wires shall be run together with circuit conductors.
- K. Equipment Connections: Connect all equipment and appliances. Make power connections to motor on equipment with flexible conduit. Provide disconnect switches for all motorized equipment if none is furnished with the equipment. Furnish starters with overload protection on each leg for all motorized equipment if none is furnished by other trades.
- L. Finishing:
1. Patch, repair and restore all structural and architectural elements cut or drilled for installation of electrical system. Drilling, cutting, patching, repairing and restoring shall be subject to approval of Architect.
 2. Attach electrical equipment to wood by wood screws, and to concrete by embedded or expansion inserts and bolts. Use power-driven charge with approval only. Close unused knock-outs on boxes or enclosures with metal cap. Powder actuated fasteners shall not be used on precast concrete. Do not use powder activated fasteners to attach enclosures and boxes to the building.

3. Wipe clean all exposed raceways and enclosures with rags and solvent. Prime painting and finishing of unfinished raceways, and enclosures shall conform to SECTION 09 90 00 – PAINTING AND COATING. Factory finished enclosures shall not be painted. Panelboards, switches, circuit breakers, junction boxes, and equipment shall be identified by engraved plastic nameplates on cover or door. Voltage and phase shall be indicated on nameplates for panelboards, switches and circuit breakers.
4. Connect circuits to circuit assignments shown on drawings. Provide neatly typewritten circuit directory for all panelboards. Circuit directory shall indicate location of loads served by each circuit.
5. Label all panels and service equipment with phenolic labels. Tag all empty conduits with fiber disc tags at bushings.

3.2 TESTING

- A. All wiring shall be tested to insure proper operation according to functions specified.
- B. Measure insulation resistance of all feeder wires. All feeder cables, #4 or larger, shall have insulation resistance of 1.5 megaohms or higher. Insulation resistance shall be measured by 500 volts megger. Resistance of feeder cables shall be recorded and turned over in 4 copies to the Architect during final inspection.
- C. Balance loading on each feeder.
- D. Measure ground resistance at service equipment.

3.3 GUARANTEE

- A. Installation shall be complete in every detail and ready for use. Any item supplied by Contractor developing defects within one year of final acceptance by Owner, except lamps which shall be guaranteed for 50% of rated life as published by manufacturer, shall be replaced by such materials, apparatus or parts including installation labor to make such defective portion of complete system conform to true intent and meaning of drawings and specifications, at no additional charge to the Owner.

END OF SECTION

SECTION 26 05 10 – BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. As specified in SECTION 00 70 00.

1.2 WORK DESCRIPTION

- A. Section Includes: Basic electrical requirements specifically applicable to DIVISION 26 – ELECTRICAL sections in addition to DIVISION 01 – GENERAL REQUIREMENTS sections.

1.3 PROJECT PHASING

- A. Coordinate electrical schedule and operations with the Owner.

1.4 DRAWINGS

- A. Electrical drawings are schematic and indicate general layout and approximate locations of outlets, switches, luminaires, service runs, feeder runs, devices, and other electrical equipment. Make minor adjustments in layouts to ensure coordination.
- B. Review contract drawings and specifications, and verify locations of structural members, equipment, apparatus, and other conditions which may affect work. Provide conduit transitions and offsets, junction boxes and similar fittings as necessary to install complete electrical systems.
- C. Coordinate work with wiring and equipment included in other sections and divisions of the specifications.
- D. Design and layouts indicated on drawings are based on specified products and equipment. Provide modifications required to materials, components and equipment to accommodate products and equipment other than specified.
- E. Obtain Architect's acceptance of significant deviations from drawing layouts before performing the work.
- F. Architect or Owner reserves the right to relocate any device within 10 feet of its indicated location up to the time of its installation without additional cost to the Owner.

1.5 SUBMITTALS

- A. Submit under provisions of SECTION 01 33 00 – SUBMITTAL PROCEDURES.

- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.
 - 1. Submit quantities required in SECTION 01 33 00 – SUBMITTAL PROCEDURES plus one additional copy to be retained by the Architect.
 - 2. Include submittals for the following items:
 - a. SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL: Gutters, pullboxes and cabinets.
 - b. SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL: Panelboards, equipment, disconnect switches, and circuit breakers.
 - c. SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL: Wiring devices, cables.
 - d. SECTION 26 50 00 - LIGHTING: Lighting fixtures.
 - e. SECTION 28 31 00 – FIRE DETECTION AND ALARM: Fire alarm equipment and cable.
 - f. SECTION 27 52 00 – HEALTHCARE COMMUNICATIONS AND MONITORING SYSTEM: Nurse call equipment and cable.
 - g. Any other special or built-to-order equipment.
- C. Mark dimensions and values in units to match those specified.
- D. Record Documents: Provide in accordance with SECTION 01 33 00 – SUBMITTAL PROCEDURES.

1.6 REGULATORY REQUIREMENTS

- A. Conform to 2018 International Building Code.
- B. Conform to 2020 NFPA 70 National Electrical Code with Amendments, 2020 FGI Guidelines, 2018 NFPA 101 Life Safety Code, 2018 NFPA 99 Health Care Facilities Code, 2018 NFPA 1 Fire Code, and 2018 International Energy Conservation Code.
- C. Comply with ANSI, NEMA, EEI, and IPCEA standards.
- D. Obtain permits and request inspections from authority having jurisdiction. Deliver certificates of final inspection to the Architect.

1.7 PROJECT CONDITIONS

- A. Install work in locations shown on drawings, unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of Architect before proceeding.

1.8 WARRANTIES

- A. Special Warranties: Provide warranties required under the respective specification sections.
- B. Comply with procedures and requirements specified in SECTION 01 33 00 – SUBMITTAL PROCEDURES.

1.9 ELECTRICAL WORK CLOSEOUT

- A. Prepare the following items and submit to the Architect before final acceptance.
 - 1. Two copies of all test results as required under this section.
 - 2. Two copies of local and/or state code enforcing authorities' final inspection certificates.
 - 3. Copies of as-built record drawings as required under the General Conditions and this section.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 26 50 00 – LIGHTING

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. As specified in SECTION 00 70 00.

1.2 WORK DESCRIPTION

- A. Section Includes:
 - 1. All luminaires and lamps as shown on drawings will be purchased by the General Contractor.
 - 2. Furnish all labor and materials required to complete all electrical work as indicated on the drawings and/or specified herein. In general, the following work is included:
 - a. New lighting system including luminaires and accessories.
 - b. Components.
 - c. LED drivers.
- B. Related Sections:
 - 1. SECTION 26 05 10 – BASIC ELECTRICAL REQUIREMENTS.
 - 2. SECTION 26 05 00 – COMMON WORKRESULTS FOR ELECTRICAL.

1.3 INCORPORATED DOCUMENTS

- A. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this section where cited below:
 - 1. ETL: Engineering Testing Laboratories.
 - 2. IES: Illuminating Engineering Society of North America.
 - 3. NEMA: National Electrical Manufacturers Association.
 - 4. UL: Underwriters' Laboratories, Inc.

1.4 QUALITY ASSURANCE

- A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
- B. Supply all equipment and accessories new, free from defects and listed by Underwriters' Laboratories, Inc., or bearing its label.
- C. Supply all equipment and accessories in compliance with the applicable standards listed in paragraph 1.2 of this section and with all applicable national, state and local codes.

- D. All items of a given type shall be the products of the same manufacturer.

1.5 SUBMITTALS

- A. Submittals shall be per SECTION 01 33 00 – SUBMITTAL PROCEDURES and SECTION 26 05 10 – BASIC ELECTRICAL REQUIREMENTS.
- B. Submittals shall be complete, bound under cover and indicating project title. Contractor shall review submittals for conformance with contract documents, make necessary revisions and submit to Architect, indicating the following:
1. Manufacturer's name, brand name, and catalog reference of equipment supplied.
 2. Details of construction and finishes of luminaires.
 3. Drawings: To scale (as noted on drawings).
 4. Photometric data, including optical performance rendered by independent testing laboratory developed according to IES Methods as follows:
 - a. For down and semi-down lights used for general illumination:
 - 1) Coefficients of utilization.
 - 2) Candlepower data, presented graphically and numerically, in 10 degree increments (5 degree, 15 degree, etc.). Data developed for up and down quadrants normal, parallel, and at 45 degree to lamps if light output is asymmetric.
 - 3) Zonal lumens stated numerically in 10 degree increments (5 degree, 15 degree, etc.) as above.
 - b. For other luminaires: Candlepower curves, presented graphically and numerically, in 10 degree increments (5 degree, 15 degree, etc.), or smaller increments for narrow-beam luminaires.
 5. Luminaire lists: Submit quantity list of luminaires.
 6. Catalog information and wiring diagrams of lighting control system.

1.6 GUARANTEE

- A. Guarantee of all equipment and labor by manufacturer for one year from written notification of acceptance by the Owner.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Type of luminaires indicated by letters or letters followed by numbers. See drawings for tabulation of fixture types.
- B. LED fixtures shall be in compliance with IESNA Standard LM-80 and demonstrate L70 life after 50,000 hours.

- C. LED fixtures shall be a color temperature of 3500 degrees Kelvin unless otherwise noted. CRI of 80 minimum.
- D. Sheet Metal Luminaire Housings: Welded construction, with exceptions noted under luminaire types.
- E. Luminaire catalog numbers used to illustrate equipment type do not necessarily denote required mounting equipment or accessories. Provide accessories to suit.
- F. Chains, springs, hinges or other fastening devices required on apertures, reflectors and baffles: Removable from luminaire housings.

2.2 LUMINAIRE CONSTRUCTION

- A. Free of light leaks.
- B. Ventilation for drivers.
- C. LEDs shall be a color temperature of 3500 degrees Kelvin, a CRI of 80 minimum, and lumen maintenance L70 rating of 50,000 hours minimum.
- D. LED Drivers:
 - 1. Driver shall be of the constant current type.
 - a. Voltage: 120/277.
 - b. Constant Current.
 - c. Driver Current: 350mA-700mA.
 - d. Maximum THD: 10 percent.
 - e. Minimum Power Factor: 0.9
 - 2. Acceptable Manufacturers:
 - a. Philips Advance – Xitanium
 - b. Lutron Hi-Lume
 - c. Sylvania/Osram
 - 3. Dimmable LED Drivers: Driver shall be of the constant current type.
 - a. Voltage: 120/277
 - b. Driver Current: 350mA-700mA
 - c. 0-10v dimming, 0% to 100%
 - d. Maximum THD: 10 percent
 - e. Minimum Power Factor: 0.9

2.3 LIGHTING CONTROLS

A. Switches:

1. Single pole, 3-way, 4-way wall switches: Specification grade commercial Style Line decorator side and back wired. Flush mounting, heat-resistant plastic housing and self-grounding metal, strap. Silver or silver alloy contact. Rated 20A, at 120-277V. Use single pole, 3-way, and 4-way as indicated on drawings or required. Hubbell DS120W (single pole), DS320W (3-way), DS420W (4-way).
2. Dimmer switch: Linear slide with on/off switch. Eaton Greengate WBSD-010SLD-W.
3. Ceiling occupancy sensor: Ultrasonic and passive infrared, adjustable time delay, 277VAC, Eaton Greengate OAC-DT-1000 with SP20-MV switchpack.
4. Wall switch occupancy sensor: Automatic passive infrared, dual 120/277 VAC, adjustable time delay and sensitivity. Eaton Greengate ONW-D-1001-MV-W.

B. Wall Plates: White Stainless steel style line decorator.

2.4 CONTACT SURFACES

- A. Aluminum to Bronze: Coating equal to Minnesota Mining and Manufacturing Co., No. 1706, "Coro-Guard," applied to both surfaces.
- B. Aluminum to Concrete: Coating of polyurethane base paint, similar to Lehman Bros. "Ox-O-Deck;" or asphaltum.

2.5 WIRING

- A. 120/208 Volt Luminaire Wiring: 300 volt, 302 degrees F (150 degrees C), Type AP or SFF, beginning at separately mounted outlet box.
- B. 277/480 Volt Luminaire Wiring: 600 volt, 220 degrees F (105 degrees C). Appliance Type AWM or THHN, beginning at separately mounted outlet box.
- C. Splices: Mechanical spring pressure connector or crimp connector.
- D. Minimum 3/8 inch (9.5 mm) flexible conduit connections for recessed fixtures except as indicated. Maximum length: 6 feet, 0 inches (1.85 M).

2.6 SUPPORTS

- A. Individual Luminaires: Carry weight of fixture to building structure, clear of ducts or pipes. Do not support to ceiling systems or from mechanical or piping systems.

2.7 FINISHES

- A. Painted Surfaces, except as noted.
 - 1. Synthetic enamel, with acrylic, aklyd, epoxy, polyester, or polyurethane base, light stabilized, baked on at 350 degrees F (177 degrees C) minimum, catalytically or photo chemically polymerized after application.
 - 2. White finishes: Minimum of 85 percent reflectance.
 - 3. Metal parts: Cleaned and treated with phosphate or chromate bonding process after fabrication for maximum paint adhesion.
- B. Unpainted Aluminum Surfaces: Satin anodized, except as noted.
- C. Plastic Lenses and Diffusers: Destaticize, clear acrylic unless otherwise noted.
- D. Reflectors: Free of marks, labels or blemishes.

PART 3 – EXECUTION

3.1 INSTALLATION OF LUMINAIRES

- A. Locations:
 - 1. On drawings: Diagrammatical.
 - 2. Verify with ceiling types on the Architectural reflected ceiling drawings.
 - 3. Coordinated space conditions with other trades.
 - 4. In mechanical equipment rooms: Modify locations and mounting to suit condition as directed.
 - 5. Luminaire rows: In straight lines except as noted.
 - 6. Surface mounting: As noted.
 - 7. Under cabinet or counter: As noted.
 - 8. Coordinate space conflicts with the mechanical drawings.
- B. Mounting:
 - 1. Ceiling construction:
 - a. Refer to architectural drawings for finish schedules.
 - b. Refer to manufacturer's installation details and applicable codes for required luminaire mounting accessories.
 - 2. Recessed in plaster ceilings: Provide plaster frames:
 - a. For setting, under General Construction Work.
 - b. With bottom of frames flush with finished ceiling and forming screed edge.
 - c. Individually pendant mounted units: With canopies for pendants and junction box at the ceiling line for each luminaire.
 - d. Continuously pendant mounted units: With canopies and swivel ball aligners for pendants and junction box for each continuous run except as noted.

- C. Reflector Cones, Aperture Plates, and Decorative Elements: Install after completion of ceiling tiles, painting and general cleanup. Wipe clean of dust and fingerprints.
- D. Replace blemished, damaged, or unsatisfactory luminaires and drivers as directed.

END OF SECTION

DIVISION 27

COMMUNICATIONS

DIVISION 27 – COMMUNICATIONSS

SECTION 27 10 00 – BUILDING TELECOMMUNICATION CABLING SYSTEM

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. As specified in SECTION 00 70 00.

1.2 APPLICABLE PUBLICATIONS AND RELATED DOCUMENTS

- A. The publications cited within this specification form a part of this specification to the extent referenced. Unless otherwise indicated, most recent edition of the publication with current revisions and amendments will be enforced.
- B. General electrical requirements as specified in DIVISION 26 – ELECTRICAL.
- C. SECTION 26 05 00 – COMMONWORK RESULTS FOR ELECTRICAL, applies to this section with additions and modifications specified herein.

1.3 WORK INCLUDED

- A. Work in this section includes the structured cabling system for the telecommunication systems, which shall be provided for this project. Work includes, but is not limited to, the passive cabling infrastructure, pathways and spaces to support the telecommunication systems specified herein. Structured cabling system will be utilized to support voice (telephone) and data connections within the renovated spaces. The structured cabling system shall consist of telecommunication rooms, intra-building backbone wiring system, as well as horizontal distribution system to support the renovated spaces. Materials not normally furnished by manufacturers of these devices are specified in SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL.

1.4 SUBMITTALS

- A. Submit shop drawings and catalog cuts of the following equipment for approval in accordance with the General Conditions for the project. Each submittal prepared with a summary sheet attached to each copy individually identifying all items included in the submittal. Incomplete submittals and those without summary sheets will be returned without review.
 - 1. Telecommunication shop drawings:
 - a. Telecommunication system drawings and diagrams.
 - b. Telecommunication distribution floor plans.
 - c. Telecommunication space drawings.

- d. Telecommunication details.
2. Manufacturer's data:
 - a. Telecommunications cabling and connectors.
 - b. Termination equipment, including patch panels and termination blocks.
 - c. Telecommunication outlets, including outlet box, faceplates, and jacks.
 - d. Cable supports.
3. Qualifications: Telecommunications Contractor.
4. Test reports: Telecommunication system cabling test reports.
5. Record documentation.
6. Labeling: Telecommunications system infrastructure administration/identification scheme.

1.5 MANUFACTURER'S STANDARD OF QUALITY

- A. It is the intent of these specifications and applicable drawings to identify the essential requirements related to the telecommunications wiring system and the quality of materials, construction, design, and overall workmanship. All manufacturers shall meet these minimum requirements.
- B. All products referenced in this section may be substituted with a product of the same or better operating specifications if substitution is submitted and approved in accordance with the requirements of the Special Provisions. Contractor shall list all apparatus or materials substitutions, and provide sufficient product information or specifications, to illustrate product is equivalent to those specified herein.
- C. Products From Other Manufacturers: The products of other manufacturers that meet or exceed the material, construction, and standard of quality specified hereinafter shall be submitted for approval in accordance with the substitution request requirements set forth in the SECTION 00 70 00 – GENERAL CONDITIONS, and the requirements below:
 1. Manufacturers requesting substitution approval shall submit evidence of at least 2 years of experience manufacturing the type of products covered in this specification. Catalogs and technical data identifying conformance to the specifications shall be submitted for substitution approval.
 2. The acceptance of any other manufacturer's product shall not relieve the Contractor of his responsibility for providing a complete and functioning voice and data wiring system.

1.6 QUALITY ASSURANCE

- A. Brand names, manufacturer's names and catalog numbers indicate a standard of design and quality required. Acceptable manufacturers for telecommunication apparatus include ADC, Belden, Berk-Tek/Ortronics, Blonder Tongue, Corning, CommScope/Systimax, Leviton, Pass & Seymour, Siemon, and Suttle. All apparatus supplied shall bear the name of the approved manufacturer on its nameplates. Substitute materials may be used if pre-qualified prior to bidding by the Architect.

- B. Cabling, equipment, and hardware manufactures shall have a minimum of 3 years of experience in the manufacturing, assembly, and factory testing of components which comply with ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, ANSI/TIA/EIA-568-B.2, and ANSI/TIA/EIA-568-C.3.
- C. All Contractor personnel shall be fully trained and qualified to perform tasks associated with the installation, termination and testing of UTP, including but not limited to proper operation of cabling test devices.
- D. Supervisors and installers assigned to the installation of this system or any of its components shall have a minimum of 3 years of experience in the installation of the specified copper. They shall have factory or factory-approved certification indicating that they are qualified to install and test the provided products. Submit documentation for a minimum of 3 and a maximum of 5 successful system installations provided these are equivalent in system size and in construction complexity to the telecommunication system proposed for this project. Include specific experience in installing and testing telecommunication systems and provide names and locations of at least 2 project installations successfully completed using copper telecommunication cabling systems.

1.7 SHOP DRAWINGS

- A. Contractor shall provide shop drawings in accordance with ANSI/TIA/EIA-606-A. As a minimum, the Contractor shall provide the following drawings:
 - 1. T1 – Building floor plans with building area/serving zone boundaries: Drawing shall indicate the location of the telecommunication spaces, serving zones, backbone distribution diagrams, access points, pathways, grounding system and other systems that need to be viewed from the complete building perspective.
 - 2. T2 – Serving zones/building area drawings – drop locations and cable identification (ID's): Enlarged plan showing building area or serving zone. These drawings show drop locations, telecommunication spaces, access points and detail call outs for common equipment rooms and other congested areas.
 - 3. T3 – Telecommunication space drawings: Detailed layout of telecommunication spaces: Provide telecommunication space drawings which as a minimum include telecommunications room plan views, pathway layouts, mechanical/electrical utility support layout, rack/cabinet elevations, and backboard elevations. Drawings shall show layout of applicable equipment including incoming cable connector blocks, outgoing cable connector blocks, patch panels, equipment spaces, and cabinet/racks. Drawings shall also include a complete list of equipment and material, equipment rack/cabinet details, proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of work including clearance for maintenance and operation.
 - 4. T4 – Typical detail drawings: Detailed drawings of symbols and typical details for faceplate labeling/identification, faceplate types, faceplate population installation procedures, detail racking and raceways.

1.8 RECORD DOCUMENTATION

- A. In addition to the standard close out documentation, Contractor shall provide T5 drawings including documentation on installed cables and termination hardware in accordance with ANSI/TIA/EIA-606-A. T5 drawings shall include schedules to show information for cutovers and cable plant management, patch panel layouts and cover plate assignments, cross-connect information and connecting terminal layout as a minimum. Provide hard copy documentation for the following T5 drawings as a minimum:
1. Cables: A record of installed cables shall be provided in accordance with ANSI/TIA/EIA-606-A. The cable records shall include only the required data fields in accordance with ANSI/TIA/EIA-606-A. Included manufacture date of cable with submittal.
 2. Termination hardware: A record of installed patch panels, cross-connect points, distribution frames, terminating block arrangements and type, and outlets shall be provided in accordance with ANSI/TIA/EIA-606-A. Documentation shall include the required data fields, as a minimum, in accordance with ANSI/TIA/EIA-606-A.

1.9 DEFINITION OF TERMS

- A. Apparatus: Generally used herein to include the inter-building cable system, station wiring, cable racks, wiring and equipment frames, cross connect equipment and wiring adapters, information outlets and faceplates, designation strips, materials, supplies or whatsoever that may be purchased, together with the usual appropriate fittings, attachments, appurtenances, and appliances required for the intended operation.
- B. Work Specification: The technical specification describing the scope of work, including the engineering, furnishing, delivery, installation and testing of the telecommunication wiring system.
- C. Intra-Building Wiring System: A wiring system, which includes necessary apparatus, providing communications within a building.
- D. Horizontal Distribution System: The part of the premise distribution system that provides connection between the horizontal cross connect point within the equipment and/or telecommunications room and the work area.

1.10 WARRANTY

- A. Contractor shall warrant the installation and provide an application/ manufacturer's warranty in addition to the standard installation, workmanship, and equipment warranty.
1. Application/manufacturer's warranty: Contractor shall extend an application/manufacturer's warranty to the Owner. This warranty guarantees that the cable shall be able to support the operation of any application operating at the cables standard rated bandwidth/frequency (minimum of oneGbps at 250-MHz) for a period of at least 15 years. As an example, Commscope (Systimax Solutions) offers the SYSTIMAX product's exclusive SYSTIMAX 20-year product and applications warranty. Contractor shall register the installation with the manufacturer to secure such extended warranties and assurances.

2. Installation warranty: Contractor shall warrant to the Owner that the installation, workmanship, equipment, and/or material to be furnished herein shall be new and free from defects in material and workmanship for a period of no less than 2 years from the date of project acceptance; and will be of the kind and quality designated or described herein and shall perform in the manner set forth in the contract. At time of acceptance, Contractor shall guarantee that the Owner shall be in sole ownership and title to all materials and equipment, which shall be free of any encumbrance or claims imposed by a third party.
- B. If it appears within 2 years from the date of project acceptance, and/or title passage that the installation, workmanship, equipment and/or material furnished hereunder does not meet the warranties specified above and the Owner notifies the Contractor promptly, the Contractor shall thereupon correct any defect, including non-conformance with the contract, without delay and expense to the Owner.
- C. If Contractor is obliged to correct defects as specified above, the warranty period for the repaired or replacement part shall be warranted for the remaining warranty term, as determined by the original date of acceptance.
- D. The User (Kona Community Hospital) shall also be entitled to all manufacturer's warranties and guarantees associated with the apparatus or materials provided by the Contractor.

PART 2 – PRODUCTS

2.1 COMPONENTS

- A. UL or third party certified. Provide a complete system of the telecommunications cabling and pathway components using a hierarchical star topology and support structures, pathways and spaces complete with conduits, pull wires, terminal boxes, outlets, cables, junction boxes, and backboards. Fixed cables and pathway systems for telecommunication systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70.

2.2 PATHWAYS

- A. ANSI/TIA-569-B and Addenda. Pathways shall consist of conduit installations. Provide grounding and bonding as required by the National Electrical Code (NFPA 70) and TIA J-STD-607-A.
- B. Conduit Distribution: Refer to SECTION 26 05 00 – COMMONWORK RESULTS FOR ELECTRICAL for acceptable conduit distribution infrastructure.

2.3 TELECOMMUNICATIONS CABLING INFRASTRUCTURE

- A. Cabling shall be UL listed for the application and shall comply with ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, ANSI/TIA/EIA-568-C.2, ANSI/TIA/EIA-568-C.3 and NFPA 70. Provide a labeling system for cabling in accordance with hospital labeling standards and as required by ANSI/TIA/EIA-606-A and UL 969. Cabling manufactured more than 12 months prior to date of installation shall not be used.
- B. Horizontal voice/data cabling: Comply with NFPA 70, NEMA WC 63.1, ICEA S-90-661 and performance characteristics in ANSI/TIA/EIA-568-C.0 and ANSI/TIA/EIA-568-C.1. Horizontal UTP cabling shall not exceed 295-feet of cabling distance between the horizontal cross-connect point and the telecommunications outlet at work area.
 - 1. Horizontal UTP voice copper: ANSI/TIA/EIA-568-C.2, NFPA 70, UTP (unshielded twisted pair), 100-ohm. Provide 4 each individually twisted pair, minimum 24 AWG conductors, Category-6, plenum (CMP) rated with a white PVC jacket.
 - 2. Horizontal UTP data copper: ANSI/TIA/EIA-568-C.2, NFPA 70, UTP (unshielded twisted pair), 100-ohm. Provide 4 each individually twisted pair, minimum 24 AWG conductors, Category-6, plenum (CMP) rated with a blue PVC jacket.

2.4 TELECOMMUNICATIONS OUTLET BOXES

- A. Telecommunications Outlet Boxes: UL514A, cadmium or zinc-coated, if ferrous metal. Provide standard type 4 11/16" square by 2 1/8" deep with reducer ring. Mount flush in finished walls at height specified for outlet receptacles. Depth of boxes shall be large enough to allow manufacturers' recommended conductor bend radii.

2.5 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES

- A. Outlet/Connector UTP Copper:
 - 1. Outlet/connectors shall comply with FCC Part 68.5, ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, and ANSI/TIA/EIA-568-C.2.
 - 2. Telephone/data outlet/connectors shall be UL 1863 listed, non-keyed, 8-pin modular, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with ANSI/TIA/EIA-568-C.2 Category-6 requirements. Outlet/connectors provided for UTP cabling shall meet or exceed the requirements for the cable provided. Outlet/connectors shall be terminated using a Type 110 IDC PC board connector, color-coded for both T568A and T568B wiring. Each outlet/connector shall be wired T568A. UTP outlet/connectors shall comply with ANSI/TIA/EIA-568-C.2 for 200 mating cycles. Provide white outlet/connector for voice positions and blue outlet/connector for data positions.
- B. Cover Plates: White Telecommunications cover plates shall comply with UL 514C, ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, ANSI/TIA/EIA-568-C.2, and ANSI/TIA/EIA-568-C.3.

2.6 BACKBOARDS

- A. Provide void-free, interior A/C grade plywood 3/4 inch thick and sized as required. Backboards shall be fire rated or covered with 2 coats of gray or a lighter color, nonconductive, fire-retardant paint. Do not cover the fire stamp on the backboard.

2.7 GROUNDING AND BONDING PRODUCTS

- A. Comply with UL 467, ANSI J-STD-607-A, and NFPA 70. Components shall be identified as required by ANSI/TIA/EIA-606-A.

2.8 IDENTIFICATION

- A. Provide equipment nameplates in accordance with SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL. Passive telecommunications infrastructure components and cabling shall be labeled and identified in accordance with hospital labeling standards and ANSI/TIA/EIA-606-A.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Telecommunications cabling and pathway systems, including the horizontal and backbone cable, pathway systems, telecommunications outlet/connector assemblies, and associated hardware shall be installed in accordance with ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, ANSI/TIA/EIA-568-B.2, ANSI/TIA/EIA-568-C.3, ANSI/TIA -569-B, NFPA 70, and UL standards as applicable. Cabling shall be connected in a hierarchical star topology network. Daisy chaining cables between outlets is not acceptable. Metal raceway bases, covers, and dividers shall be bonded and grounded in accordance with ANSI J-STD-607-A.

1. Cabling:

- a. Install UTP and optical fiber telecommunications cabling and pathway system as detailed in ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, ANSI/TIA/EIA-568-C.2, and ANSI/TIA/EIA-568-C.3. Screw terminals shall not be used. Use an approved insulation displacement connection (IDC) tool kit for copper cable terminations. Do not untwist UTP cables more than 1/2" from the point of termination to maintain cable geometry. Provide service loop on each end of the cable, minimum 10 feet unless otherwise noted, at each backboard location and in the electrical/ telecommunications closet. Do not exceed manufacturers' cable pull tensions for copper cables. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for 4 pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. For UTP cable bend radii shall not be less than six times the cable diameter.
- b. Horizontal cabling: Install horizontal cabling and pathways between electrical/telecommunications closet and telecommunications outlet assemblies in accordance with project requirements and ANSI/TIA/EIA wiring standards.

2. Pathway Installations:
 - a. Comply with ANSI/TIA -569-B and associated addenda. Conceal conduit within finished walls, ceilings, and floors where possible. Keep conduit minimum 6 inches away from parallel runs of electrical power equipment, flues, steam, and hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit is visible after completion of project.
 - b. Telecommunications conduit distribution installation:
 - 1) Telecommunication conduit distribution will be utilized to support for intra-building backbone and horizontal distribution pathways.
 - 2) Metallic conduits shall be used for all overhead conduit distribution systems concealed in accessible ceiling spaces and when concealed within walls.
 - 3) PVC conduits not acceptable for telecommunications distribution under this project.
 - 4) Where conduits are exposed below 8'-0" and/or subject to physical damage, galvanized rigid steel (GRS) conduit shall be utilized. Electrical metallic tubing (EMT) acceptable for telecommunications distribution where mounted concealed within new walls and/or mounted above 8'-0" AFF.
 - 5) Provide conduit supports as required by NEC and recommended ANSI/TIA-569-B. Provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction. Supports shall be spaced per manufacturer's recommendation, but not more than 10-feet on center. Conduit distribution shall also be supported within 3-feet of all conduit termination points.
3. Work Area Outlets:
 - a. Terminations: Terminate UTP cable in accordance with ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, ANSI/TIA/EIA-568-C.2, and wiring configuration as specified.
 - b. Faceplates: As a minimum, each jack shall be labeled as to its function and a unique number to identify cable link.
 - c. Cables: Unshielded twisted pair shall have a minimum of 6 inches of slack cable loosely coiled into the telecommunications outlet boxes. Minimum manufacturer's bend radius for each type of cable shall not be exceeded.
 - d. Pull cords: Pull cords shall be installed in all conduits that do not initially have cable installed.
4. Telecommunications closet termination: Install termination hardware required for copper system. An insulation displacement tool shall be used for terminating copper cable to insulation displacement connectors.
5. Grounding and bonding: In accordance with ANSI J-STD-607-A and NFPA 70.

3.2 LABELING

- A. Labels: All labels shall be in accordance with ANSI/TIA/EIA-606-A. Handwritten labeling is unacceptable. Stenciled lettering for voice and data cables shall be provided using either thermal ink transfer process or laser printer.

- B. Cable: All cables shall be labeled using color labels on both ends with identifiers as indicated on the drawings.
- C. Termination Hardware: All communication outlets and patch panel connections shall be labeled using color coded labels with identifiers as indicated on the drawings.

3.3 TESTING

- A. Telecommunications Cabling Testing: Perform telecommunications cabling inspection, verification, and performance tests on all new and relocated/rerouted cabling in accordance with ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, ANSI/TIA/EIA-568-C.2, and ANSI/TIA/EIA-568-C.3.
 - 1. Inspection: Visually inspect cabling jacket materials for UL or third party certification markings. Visually inspect UTP and optical fiber jacket materials for UL or third party certification markings. Inspect cabling terminations at backboards and at outlets to confirm color code for tip and ring pin assignments, and inspect cabling connections to confirm compliance with ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1, ANSI/TIA/EIA-568-C.2, and ANSI/TIA/EIA-568-C.3. Visually confirm marking of outlets, wall plates, outlet/connectors, and patch panels.
 - 2. Verification tests: Telephone cabling shall be tested for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors, and between conductors and shield, if cable has overall shield. Test operation of shorting bars in connection blocks. Test cables after termination, but not cross-connected.
 - 3. Performance tests: Perform Category-5e link tests for each outlet in accordance with ANSI/TIA/EIA-568-C.0, ANSI/TIA/EIA-568-C.1 and ANSI/TIA/EIA-568-C.2. Tests shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew.
 - 4. Final verification tests: Perform verification tests for UTP systems after the complete telecommunications cabling and workstation outlet/connectors are installed.
 - a. Voice tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local and long distance telephone call.
 - b. Data tests: These tests assume Kona Community Hospital IT staff is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

END OF SECTION

SECTION 27 52 00 – HEALTHCARE COMMUNICATIONS AND MONITORING SYSTEM

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. As specified in SECTION 00 70 00.

1.2 SUMMARY

A. General:

1. Drawings and conditions of the contract, including but not limited to General Conditions, and the Special Conditions listed below, apply to work of this section.
 - a. Supplementary Instructions to Bidders
 - b. Supplementary Conditions
 - c. Summary of the Work
 - d. Project Coordination
 - e. Cutting and Patching
 - f. Definitions and Standards
 - g. Submittals
 - h. Schedules and Reports
 - i. Temporary Facilities
 - j. Security Regulations
 - k. Safety and Health
 - l. Products
 - m. Project Closeout
2. Project/Work Identification: Contract documents indicate the scope of work of the contract, and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated on the contract documents include, but are not necessarily limited to, the following:
 - a. Existing site conditions and restrictions
 - b. Other work prior to work of contract
 - c. Alterations and coordination with existing work
 - d. Other work to be performed concurrently by Owner
 - e. Other work to be performed concurrently by separate Contractors
 - f. Other work subsequent to work of Contract
 - g. Requirements for occupancy by Owner prior to completion of work of contract

B. Work Description:

1. This performance specification provides the minimum requirements for a supervised audio-visual Voice over IP-based Nurse Call System. The System shall include, but not be limited to all equipment, materials, labor, documentation, and services necessary to furnish and install a complete, operational Voice over IP-based Nurse Call System. The System shall comply in respects with all pertinent codes, rules, regulations, and laws of the hospital authority and local jurisdiction. The System shall comply in all respects with the requirements of the specifications, Manufacturer's recommendations and Underwriters Laboratories Inc. (UL) Listings.
2. System shall be a standalone nurse call system.
3. It is further intended that upon completion of this work, the Owner be provided with complete information and drawings describing and depicting the entire System(s) as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the System(s) at a future date, and complete documentation of System(s) testing.

C. Interpretation: No interpretations of the meaning of the bid documents will be made to any Bidder orally. Each request for such interpretation shall be made to the Architect in writing.

D. Manufacturer:

1. Acceptable Nurse Call System Manufacturers include: Ascom Patient Systems US, supplied by Johnson Controls Incorporated, contact Amy Loo (808) 425-2731.
2. All equipment and components shall be the Manufacturer's current model. The materials, appliances, equipment, and devices shall be tested and listed by a nationally recognized approval agency for use as part of a Nurse Call System. The Manufacturer's representative shall be responsible for the satisfactory installation of the complete System.
3. The Contractor shall provide, from the acceptable Manufacturer's current product lines, equipment and components, which comply, with the requirements of these specifications. Equipment or components, which do not provide the performance and features required by these specifications, are not acceptable, regardless of manufacturer.
4. The Manufacturer of the System equipment shall be regularly involved in the design, manufacture, and distribution of all products specified in this document. These processes shall be monitored under a quality assurance program that meets ISO requirements. The Manufacturer shall have the financial stability to provide project financing/lease options to the Owner if desired.
5. All System components shall be the cataloged products of a single Supplier. All products shall be listed by the Manufacturer for their intended purpose. Ascom Patient Systems US products constitute the minimum type and quality of equipment to be installed.
6. All connected field electronics shall be both designed and manufactured by the same company, and shall be tested to ensure that a fully functioning System is designed and installed. The VoIP-based Nurse Call System shall utilize Ethernet topology, switches, gateways, and devices. These devices shall make up a UL 1069 Listed nurse call LAN/WAN. The Nurse Call System shall be FDA Registered, Class II, 501(k) exempt.

1.3 REFERENCES

A. General (References):

1. All work and materials shall conform to all applicable Federal, State, and local codes and regulations governing the installation. If there is a conflict between the referenced standards, federal, state, or local codes, and this specification, it is the Bidder's responsibility to immediately bring the conflict to the attention of the Engineer for resolution. National standards shall prevail unless local codes are more stringent. The Bidder shall not attempt to resolve conflicts directly with the local authorities unless specifically authorized by the Engineer.
2. System components proposed in this specification shall be listed by Underwriters Laboratories, Inc. (UL) to operate together as a System. The Supplier shall be responsible for filing all documents, paying all fees (including, but not limited to plan checking and permits), and securing all permits, inspections, and approvals. Upon receipt of approved drawings from the authority having jurisdiction, the Supplier shall immediately forward two sets of drawings to the Owner. These drawings shall either be stamped as approved or a copy of the letter stating approval shall be included.

B. Definitions:

1. AFF: Above Finished Floor
2. AHJ: Authority Having Jurisdiction
3. Approved: Unless otherwise stated, materials, equipment, or submittals approved by the Authority or AHJ.
4. Circuit: Wire path from a group of devices or appliances to a control module.
5. DL: Dome Light
6. ESM: Event Subscription Manager
7. FDA: Food and Drug Administration
8. IP: Internet Protocol
9. IPN: IP Network
10. PD: Peripheral Device
11. PN: Peripheral Network
12. SC: Staff Console (Master Station)
13. UL or ULI: Underwriters Laboratories, Inc.
14. UL Listed: Materials or equipment Listed and included in the most recent edition of the UL Equipment Directory.
15. VTG Approved

1.4 SYSTEM DESCRIPTION

A. General

1. The System shall be network-based and incorporate decentralized, distributed intelligence architecture. This intelligent architecture shall be built on an IP (Internet Protocol) network. The System shall allow both data and voice to be distributed over a common network infrastructure. With this being a clinic area, there are no provisions for audio devices in the rooms, which is consistent with the communication industry. Communication devices on the network will utilize standards-based protocols.
2. Each System shall be capable of supporting dome lights and Peripheral Stations as required by project plans. There are no networking requirements to other nurse call systems or other nurse call integrations.
3. The System shall consist of (include):
 - a. Table Display. Ascom model NGTDSHA-H.
 - b. Station Gateways. Ascom model NGGTWY2
 - c. Ethernet Switches/powered distribution hubs. Ascom model NGCISC08-H.
 - d. Duty Station. Ascom model NUSPM-HU.
 - e. Wash room pull cord. Ascom model NUPC3-HU.
 - f. Dome light. Ascom NUDL4S-H.
4. It shall be possible to configure the System using a modular, flexible GUI application that provides the system administrator the ability to manage, (add, delete, modify) and diagnose information within the nurse call network. Systems not supporting administrative access remotely shall not be accepted.
5. The System shall not rely on any computer for operation. Systems requiring a PC to be connected for operation shall not be accepted.
6. The system architecture shall not require external power supplies. Systems requiring power supplies to be installed separately from the control equipment shall not be accepted.

B. Stations: Peripheral Stations:

1. Peripheral Stations are addressable initiating devices that provide patient room call-for-assistance indication to the patient-staff communications system. When a Peripheral Station is activated, visual indication of the call displays at the dome light associated with the patient room, and an appropriate call indication registers on the staff console, as well as on any installed and covering annunciators.
2. These stations shall be configurable to generate any level of call supported by the system configuration. Examples of Peripheral Stations are: Lavatory, Staff Emergency, Remote Cancel, Housekeeping, Code Blue, Code Pink, Urgent, Staff Normal, Manual Presence, Auxiliary Inputs, etc.
3. Pushbutton/Pull Cord Stations shall be field configurable to allow one, two, or three pushbuttons, with or without a pull cord.
4. Call type/priority for each pushbutton or pull cord shall be programmable in system programming to annunciate the Owner-determined call type. The physical device button label shall be replaceable to match the specified call type/priority.

5. Peripheral Station buttons shall be configurable for "Toggle On / Toggle Off", supporting bed management, patient flow, workflow and other non-clinical type events, as defined by the Owner. Check latest configuration options to clarify any limitations.
 6. Peripheral Stations shall provide on-board lighting for visibility in dark rooms.
 7. Peripheral Stations shall require only two wires for installation.
 8. Peripheral Stations shall use RJ45 connectors.
 9. Each Peripheral Station button shall have a dedicated LED to indicate that the button has been pressed or is actively indicating a call.
 10. All Peripheral Stations shall have the ability to be individually numbered to represent a separate and distinct location, even stations that are in the same daisy chain.
 11. Peripheral Stations shall not require any screws to be removed for maintenance personnel to remove the station.
 12. Peripheral Stations shall have DIP switches that require manual setting by field personnel. Each station shall have a preconfigured identification number that specifies the station type automatically.
 13. Peripheral Stations shall be hot swappable and not require system shutdown or removal of power prior to replacement.
 14. Peripheral Station pull cords shall be made of a non-contaminant material to reduce the spread of nosocomial infections. Pull cords made of cotton or other absorbent materials will not be accepted.
 15. Peripheral Stations shall provide a cleaning mode to allow housekeeping to clean station surfaces without generating false calls. Activating cleaning mode shall temporarily disable front panel buttons for a configurable period of time.
 16. All Peripheral Stations must be fully supervised.
 17. Provide Peripheral Stations compatible with Ascom system.
- C. Consoles, Annunciators and Lights:
1. Corridor Lights:
 - a. Corridor (dome) and zone lights provide bright, easy-to-see visual annunciation that speeds response time and increases caregiver efficiency. These devices are typically installed in corridors and outside patient rooms to provide staff with a visual cue as to the origin of a call placed on the system.
 - b. Corridor (dome) lights operate in a similar fashion to annunciator panels or staff consoles: the light color and flash rate indicates the type and priority of the call. Models are available with one, two, or four sections.
 - c. Each Corridor Light shall utilize Light Emitting Diodes (LED) for displaying colors. Corridor Lights utilizing incandescent bulbs shall not be accepted.
 - d. Corridor and Zone Lights shall be available in one, two, or four sections.
 - e. To maintain aesthetics, reduce obstruction, and limit risk of damage to devices, the maximum size of each Corridor Light shall not be greater than 5 inches in length, nor shall it protrude more than 3.5" from the mounted surface.
 - f. Each Corridor Light section shall be capable of indicating in excess of eight Owner-selected configurable colors. Corridor Lights requiring more than four sections to provide this many colors shall not be acceptable.

- g. To allow for maximum flexibility, the Corridor Light shall be configurable via programming to allow multiple sections of a single light to illuminate and/or flash the same color for higher priority calls.
 - h. Corridor Lights shall be able to match most existing Corridor Light schemes via programming. Systems with corridor light schemes that are not able to match existing systems will not be accepted.
 - i. Any corridor lights requiring the replacement of filter caps or lenses to obtain facility-requested corridor light colors for any priority shall not be accepted.
 - j. Corridor Light shall provide a diagnostic indication of room status to prevent maintenance personnel from disrupting patients.
 - k. Provide Corridor Lights compatible with Ascom system.
2. Staff Consoles:
- a. The Staff Console is a primary point of contact among users of the system. It operates as both a user interface and a communications device that sends and receives data and audio signals over the IP network.
 - b. As a user interface, the Staff Console alpha-numerically displays incoming calls from stations and connected healthcare equipment, and provides a means for the operator to prioritize and respond to selected events. As an audio device, it provides audible signaling functions and facilitates two-way full-duplex staff/patient and staff/staff communications.
 - c. The Staff Console shall provide visual identification of the calling station(s) by room number, bed identification, priority, station type or call type. Staff Console audible annunciation shall indicate priority level. Incoming calls shall be displayed on the color display in the colors for their associated priority levels. Staff Console shall also display an elapsed time for each pending call.
 - d. The Staff Console shall be IP-based, utilizing Voice over IP technology.
 - e. The Staff Console shall have a 7" backlit color touch LCD screen.
 - f. The touch screen shall utilize programmable soft keys as opposed to a mechanical dial/touchpad.
 - g. Staff Console display shall provide an adjustable tilt mechanism for viewing clarity.
 - h. Intercom audio between the Staff Console and any audio station(s) in the System shall be full duplex. With this being a clinic area, the room devices consist of non-audio stations and therefore will have no audio capability. Systems capable of only one-way (half-duplex) audio shall not be accepted.
 - i. The Staff Console shall connect to the nurse call LAN/WAN utilizing CAT 6 cable and powered Ethernet. No separate power supply or wiring shall be used.
 - j. The call pending screen on the Staff Console shall allow five calls to be visible at a time and provide a simple scrolling function to view additional calls when more than six pending calls are present. Pending calls shall be displayed in priority order regardless of the order in which they are received.
 - k. The Staff Console shall have the ability to "automatically select" incoming calls in order of priority, or to allow the user to select what call to answer from the pending calls list.
 - l. The user shall have the ability to adjust the volume of the Staff Console incoming call tones.

- m. Owner shall be able to make available or remove selected functions/buttons from the Staff Console screens where selected functions are not to be used and to simplify operation. Functions/buttons that can be removed include Audio Page, Swing/Capture/Share and volume adjustments.
- n. Owner shall be able to make available or password protect selected functions/buttons from the Staff Console where functions are to be restricted to approved users. Functions/buttons that can be restricted include Audio Page, Swing/Capture/Share, Reminder Clear and volume adjustments.
- o. The Staff Console shall provide users the ability to go into half duplex mode to provide the ability to not transmit discussions at the nurse station into patient rooms.
- p. The Staff Console shall be able to call other Staff Consoles, Annunciators and VoIP Staff Stations on the same network. Staff Console/Annunciator/ VoIP Staff Station to Staff Console/Annunciator/VoIP Staff Station audio shall be full VoIP, full duplex.
- q. Staff Consoles and Annunciators shall be programmable to receive and display selected call priorities from desired areas, or to delay selected calls for a programmable interval.
- r. Staff Consoles shall have the ability to adjust independent talk and listen volume levels via easy-to-use touchscreen controls. These settings shall be adjustable on a room-by-room basis. Systems using group or zone-wide audio adjustments shall not be accepted.
- s. Provide Ascom model number NGTDSP-H.

D. Network Equipment: Switches and Gateways:

- 1. All control equipment shall be IP-based, utilizing IP Switches and gateways for connection to room devices. These devices shall make up a UL 1069 Listed Nurse Call LAN/WAN. The controller equipment shall mount in a standard 19" rack to be shared with the facility's IT equipment or shall mount in an independent rack. The IP switches and gateways shall have power supplies to support all field devices internally. Systems using a proprietary enclosure/card cage for central equipment and/or requiring power supplies apart from the control equipment shall not be accepted.
- 2. IP Switches for each area shall not be networked and shall act as a single, stand-alone system and will not connect to the hospital's network, any other nurse call system (area) or any nurse call integrations.

1.5 SUBMITTALS

A. Submit under provisions of SECTION 01 33 00 - SUBMITTAL PROCEDURES.

B. Project Submittal:

- 1. The Contractor shall purchase no equipment for the System specified herein until the Owner has approved the project submittals in their entirety and has returned them to the Contractor. It is the responsibility of the Contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the Contractor to proceed with the installation and shall not be construed to mean that the Contractor has satisfied the requirements of these specifications. The Contractor

shall submit three (3) complete sets of documentation within 30 calendar days after a purchase order is awarded.

2. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements in the contract documents. In addition, the Contractor shall provide specific notation on each shop drawing, sample, catalog sheet, installation manual, etc. submitted for review and approval, of each variation.
- C. Closeout Submittal: Two (2) copies of the following documents shall be delivered to the building Owner's Representative at the time of System acceptance. The closeout submittals shall include:
1. Project-specific operating manuals covering the installed System.
 2. As-built drawings consisting of: a scaled plan of each building showing the placement of each individual item of equipment, as well as raceway size and routing, junction boxes, and the conductor size, quantity, and color in each raceway. All drawings must reflect point-to-point wiring, device addresses, and programmed characteristics.
 3. The application program listing for the System as installed at the time of acceptance by the building Owner (disk, hard copy printout, and all required passwords).
 4. The name, address, and telephone number of the authorized factory Representative.

1.6 QUALITY ASSURANCE

A. Qualifications of Contractor:

1. The Contractor shall have successfully installed similar Systems of comparable size and complexity. The Owner reserves the right to reject any control components for which evidence of a successful prior installation performed by the Contractor cannot be provided.
2. The Contractor shall have in-house engineering and project management capability consistent with the requirements of this project. Qualified and approved Representatives of the System Manufacturer shall perform the detailed engineering design of all control equipment. Qualified and approved Representatives of the System Manufacturer shall produce all drawings, submittals, and operating manuals. The Contractor is responsible for retaining qualified and approved Representative(s) of those System Manufacturers specified for detailed System design and documentation, coordination of System installation requirements, and final System testing and commissioning in accordance with these specifications.

B. Pre-Installation Requirements:

1. The provider shall submit a detailed project plan that will describe in detail how the provider will approach the project from inception to finalization. The plan must include at a minimum the following information:
 - a. Project Staging
 - b. Project Management
 - c. Equipment Schedules
 - d. Installation Time Lines
 - e. Other Trade Requirements

- f. Final Acceptance Testing
 - g. Personnel Resumes
 - h. Progress Report Sample
2. All equipment and components shall be installed in strict compliance with each Manufacturer's recommendations. Consult the Manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning System installation. Refer to the Manufacturer's riser/connection diagrams and details for all specific System installation/termination/wiring data.

1.7 DELIVERY, STORAGE AND HANDLING

A. Receiving and Handling:

- 1. The Contractor shall be responsible for all receiving, handling, and storage of his materials at the job site.
- 2. Use of loading docks, service driveways, and freight elevators shall be coordinated with the Owner.

B. Storage:

- 1. The Owner will provide the Contractor with a lockable storage space for the Contractor's use during this project. The Contractor shall be responsible for the security of this space.
- 2. Overnight storage of materials is limited to the assigned storage area. Materials brought to the work area shall be installed the same day or returned to the assigned storage area unless previously approved by the Owner.

C. Rubbish:

- 1. The Contractor shall remove rubbish and debris resulting from his work on a daily basis. Rubbish not removed by the Contractor will be removed by the Owner and back-charged to the Contractor.
- 2. Removal of debris and rubbish from the premises shall be coordinated with the Owner.

1.8 PROJECT CONDITIONS

A. Conditions:

- 1. It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed. Inspection of the building may be made by appointment with the Owner. Contractors are requested to inspect the building prior to the pre-bid meeting.
- 2. A pre-bid meeting will be held to familiarize the Contractors with the project. Failure to attend the pre-bid meeting may be considered cause for rejection of the Contractor's bid. The minutes of this meeting will be distributed to all attendees and shall constitute an addendum to these specifications which may warrant a change order.
- 3. The Contractor shall be responsible for prior coordination of all work and demolition with the Owner.

1.9 WARRANTIES AND MAINTENANCE

A. Warranty:

1. The Contractor shall warranty all materials, installation, and workmanship for one (1) year from date of acceptance, unless otherwise specified. A copy of the Manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals.
2. The System Supplier shall maintain a service organization with adequate spare parts stock within 75 miles of the installation. Any defects that render the System inoperative shall be repaired within 24 hours of the Owner notifying the Contractor.

1.10 TRAINING

- A. The System Supplier shall schedule and present a minimum of 8 hours of documented formalized instruction for the building Owner, detailing the proper operation of the installed System.
- B. The instruction shall be presented in an organized and professional manner by a person who has been factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: All equipment shall be attached to walls and ceiling/floor assemblies and shall be mounted firmly in place. Fasteners and supports shall be sized to support the required load.
- B. Conductors:
 1. The requirements of this section apply to all System conductors, DC power, and grounding/shield drain circuits, and to any other wiring installed by the Contractor pursuant to the requirements of these specifications.
 2. All circuits shall be rated and power limited in accordance with the National Electrical Code (NEC), and installed in conduit or enclosed raceway. All System conductors shall be of the type(s) specified herein.
 - a. Category 6.
 - b. 16 AWG Power (if applicable)

C. Conductors and Raceways:

1. The entire System shall be installed in a skillful manner in accordance with approved Manufacturer's installation manuals, shop drawings, and wiring diagrams. The owner shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets, and similar devices necessary for the complete installation. All wiring shall be of the type required by the NEC and approved for the purpose by local authorities having jurisdiction.
2. Any shorts, opens, or grounds found on new or existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.
3. All penetration of floor slabs and firewalls shall be fire-stopped by the owner in accordance with all local fire codes.

3.2 FIELD QUALITY CONTROL

A. Test and Inspection:

1. All wiring shall be tested for continuity, shorts, and grounds before the System is activated.
2. All test equipment, instruments, tools, and labor required to conduct the tests shall be made available by the installing Contractor.
3. The System, including all its sequence of operations, shall be demonstrated to the Owner or his Representative. In the event the System does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the Owner, his Representatives, and the Fire Inspector.
4. At the final test and inspection, a factory-trained Representative of the System Manufacturer shall demonstrate that the System functions properly in accordance with these specifications. The Representative shall provide technical supervision, and shall participate during all of the testing for the System.

END OF SECTION

DIVISION 28

ELECTRONIC SAFETY AND SECURITY

DIVISION 28 – ELECTRIC SAFETY AND SECURITY

SECTION 28 31 00 – FIRE DETECTION AND ALARM

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. As specified in SECTION 00 70 00.

1.2 WORK DESCRIPTION

- A. Section Includes: Fire alarm system.

1.3 SYSTEM DESCRIPTION

- A. Provide all equipment and accessories for a complete extension of the existing Simplex fire alarm system as described herein and as shown on the plans.
- B. Equipment and accessories furnished under the terms of this specification shall be the standard products of Simplex.
- C. System:
1. An additional addressable fire alarm system components.
 2. Signal line circuits shall be of Style 4 operation.
 3. Notification circuits lines shall be of Style Y operation.
- D. Operation: Fire alarm control panel:
1. The activation of any fire alarm station, water flow switch, or automatic detector circuit shall cause the following to happen:
 - a. Activate audible alarm devices within same zone area.
 - b. Activate visible alarm devices within same zone area.
 - c. Transmit alarm signal to fire department.
 - d. Release power feed to magnetic door holders on perimeter or in existing fire zone area.
 - e. Close fire/smoke dampers on perimeter or in existing fire zone area.
 - f. Display change of status at Kona Community Hospital front-end.
 2. The activation of any sprinkler system supervisory switch shall not sound the alarm signals but shall sound the supervisory signals and annunciate the supervisory condition on the fire alarm control panel, an alert the central monitoring station of a supervisory condition.

3. The activation of any trouble on the system shall activate the trouble signal at the fire alarm control panel, and alert the central monitoring station of a trouble condition.
4. Notification circuits shall not be initially loaded in excess of 75% of its rated ampere capacity.
5. Power supply shall be 120 volts, 60 Hz from the emergency branch. The 24 volts, DC power for all system supervisory and control functions shall be provided by the Main Fire Alarm Control Panel power supply.
6. Upon loss of building power the entire system shall operate on battery power for 24 hours and then be capable of sounding all signals for 10 minutes.

1.4 SUBMITTALS

- A. Comply with provisions of SECTION 01 33 00 – SUBMITTAL PROCEDURES.
- B. Submit shop drawings and product data in accordance with SECTION 01 33 00 – SUBMITTAL PROCEDURES.
- C. Complete sequence of operations of system.
- D. Indicated system components, size of components, location, and provide full schematic of wiring system showing building and operation details.
- E. Complete system wiring diagrams for components capable of being connected to the system and interfaces to equipment supplied by others.
- F. Submit manufacturer's installation instructions.
- G. Submit manufacturer's descriptive literature identifying components, including UL listing for all system components, operating instructions, and maintenance and repair data.
- H. Submit complete floor plans, indicating device locations, wire and quantities, room usage, point to point wiring diagram, manual station and notification appliance elevations, location of smoke/fire barriers, one line diagram showing all circuits and panels.
- I. Voltage drop calculations for all notification circuits.
- J. English language zone descriptions to be programmed.

1.5 REGULATORY REQUIREMENTS

- A. All equipment, wiring, and operation of the system shall comply with local and national codes and ordinances as adopted by local authority having jurisdiction. Specific reference is made to:
 1. Underwriters Laboratory listing and labeling of equipment.
 2. 2018 International Building Code.
 3. National Electrical Code 2020.

4. NFPA 72, National Fire Alarm Code 2018.
 5. NFPA 13, Sprinkler Code.
 6. NFPA 101, Life Safety Code 2018.
 7. NFPA 110, Emergency & Standby Power Systems (For Fire Alarm Systems).
 8. Americans with Disabilities Act.
- B. Any deviation from the regulatory requirements must be approved by the Local Fire Department or authorities having jurisdiction.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Product shall be fully compatible with the existing Simplex fire alarm system.

2.2 EQUIPMENT

- A. Addressable Manual Stations shall be single-action type. Mount at 48 inches A.F.F. per ADA requirements.
- B. Fire Detectors shall be analog photoelectric type. Alarm sensitivity shall be adjustable from the FACP or the system Monitor/Keyboard.
- C. Speaker/strobe units shall meet ADA requirements for signal intensity, and shall be mounted per NFPA 72, and to comply with ADA requirements.
- D. Alarm synchronized strobe lights shall meet ADA requirements for signal intensity, and shall be mounted per NFPA 72 and to comply with ADA requirements.
- E. Booster power supply shall be Simplex. Coordinate with fire alarm vendor on how many booster supplies are needed prior to bidding.

2.3 FIRE ALARM SYSTEM WIRING

- A. All wiring shall conform to NEC Article 760 and to the manufacturer's wiring specifications. Minimum sizes shall be as follows: Signal line circuits - #18 AWG TSP solid copper; notification circuits - #14 AWG solid copper, power circuits - #12 AWG solid copper.
- B. All wiring shall be installed in conduit (EMT).

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Installation shall be accomplished in a professional manner by qualified personnel regularly engaged in and experienced in this type of work.
- B. All wiring shall be installed in accordance with manufacturer's recommendations and the regulatory requirements list in subsection 1.5. All wire shall be copper.
- C. Fire alarm conductor terminations in control panels and annunciator panels to be made on terminal strips with a separate point for each conductor. All such strips to be number identified as shown in wiring diagram attached to inside of door of control panel. Connect wiring neatly to terminal strips. Connect clip with nylon cable straps. Set up termination of cabling so that section of the system may be isolated or shorted out for servicing.
- D. Provide nameplates, device number labeling and cable tags.
- E. Route wiring continuous between devices without splices.
- F. Install cable in conduit above accessible ceiling space and in walls.
- G. Install insulated throat fittings on conduit stub-outs for cable protection.

3.2 SYSTEM VERIFICATION

- A. The fire alarm equipment supplier shall make a thorough inspection of the complete installed fire alarm systems including all components such as manual stations, thermal detectors, products-of-combustion detectors, sprinkler flow switches, supervisory switches, controls, etc., to insure the following:
 - 1. Complete and functional system.
 - 2. Underwriters Laboratories requirements.
 - 3. Installed in accordance with manufacturer's recommendations.
 - 4. Regulations covering supervision of components are adhered to.

3.3 TESTING AND GUARANTEE

- A. The electrical contractor shall guarantee all wiring and equipment free from inherent mechanical and electrical defects for a period of one year from the date of completion.
- B. Submit a written test report from an authorized representative of the equipment manufacturer that the system has been 100 percent tested and approved. Submit prior to request for final payment.
- C. The NFPA 72 Record of Completion shall be completed and supplied.

- D. Provide a complete set of record as-built drawings, indicating system components and location, wiring, and conduit system, and operation details.
- E. Final testing shall be performed in the presence of the Local Fire Department and the Owner's representative. The final test shall include a complete test of all system devices and functions, and any additional testing requested by the Local Fire Department. The Electrical Contractor shall provide all personnel and equipment necessary to accomplish the test.

3.4 DIVISION OF RESPONSIBILITY

- A. The Electrical Contractor shall be responsible for obtaining final acceptance of the fire alarm system as required by the Local Fire Department and authority having jurisdiction.

END OF SECTION

DIVISION 31

EARTHWORK

SECTION 31 31 16 – TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Soil treatment with termiticide.

1.2 PERFORMANCE REQUIREMENTS

- A. Service Life of Soil Treatment: Soil treatment by use of a termiticide that is effective for not less than 2 years against infestation of subterranean termites.

1.3 SUBMITTALS

- A. Product Certificates: For termite control products, signed by product manufacturer.
- B. Qualification Data: For Installer of termite control products.
- C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:
1. Date and time of application.
 2. Moisture content of soil before application.
 3. Brand name and manufacturer of termiticide.
 4. Quantity of undiluted termiticide used.
 5. Dilutions, methods, volumes, and rates of application used.
 6. Areas of application.
 7. Water source for application.
- D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.
- B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.
- C. Source Limitations: Obtain termite control products from a single manufacturer for each product.

- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination" to schedule application of termiticide products.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.6 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

- A. Special Warranty: Owner's standard form, signed by Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: 2 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:
 - 1. Termiticides:
 - a. Bayer Corporation; Imaxx Pro WSP.
 - b. Syngenta; Demon Max.

2.2 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.
 - 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
 - 1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
 - 1. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

- C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION