DIXON RECREATION CENTER IMPROVEMENTS PROJECTS

OREGON STATE UNIVERSITY

PROJECT MANUAL

SPECIFICATIONS DIVISIONS 01 - 28

CONSTRUCTION DOCUMENTS

FEBRUARY 03, 2023

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SECTION 00 01 00 - SPECIFICATIONS TABLE OF CONTENTS

PROJECT MANUAL

END OF TABLE OF CONTENTS

SECTION 01 10 02 - ACCESSIBILITY BEST PRACTICES FOR OSU

PART 1 - PURPOSE

1.1 GENERAL

A. In the pursuit of becoming a fully accessible campus, Oregon State University expects all Consultants and service providers to design to 2010 ADA Standards for Accessible Design and the latest adopted edition of the Oregon Structural Specialty Code (OSSC) and to exhibit a commitment to employing Universal Design Principles in their service and product delivery. Consultants will engage with project representatives on how Universal Design Principles will enhance campus accessibility that will meet a variety of needs and create a campus that is accessible to everyone. Designers will ensure that the principles of Universal Design are considered to the project representative's satisfaction.

PART 2 - DESIGN PROCESS AND REVIEW REQUIREMENTS

- Not Used -

PART 3 - DESIGN ELEMENTS

3.1 APPLICABLE CODE, GUIDELINES AND STANDARDS

A. All design work shall comply with all applicable sections of the following (or latest upgrades, as applicable):

1. 2010 ADA Standards for Accessible Design and OSU Construction Standards.
2. 2019 Edition of the Oregon Structural Specialty Code (OSSC)
3. ICC/ANSI A117.1 – 2009 Accessible and Usable Buildings and Facilities (Referenced by OSCC)
4. Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way
5. BHMA A156.10-2011 American National Standard for Power Operated Pedestrian Doors
6. BHMA A156.19-2013 American National Standard for Power Assist and Low Energy Power Operated Doors
7. NFPA 72: National Fire Alarm and Signaling Code – 2013
8. ORS 447.233 - Oregon Transportation Commission Standards for Accessible Parking Spaces (2017)
9. ORS 447.220 - It is the purpose of (state law) to make affected buildings, including but not limited to, commercial facilities, public accommodations, private entities, private membership clubs and churches in the state accessible to and usable by persons with disabilities, as provided in the Americans with Disabilities Act.

3.2 REFERENCES

A. The Principles of Universal Design – The Center for Accessible Design (NC State University – 1997)

B. Access for Everyone – Dr. Arvid E Osterberg (Iowa State University - 2010)

C. Signs and the ABA/ADA – Sharon Toji (2010)

D. Equal Access: Universal Design of Physical Spaces – Sheryl Burgstahler, Ph.D. (University of Washington – 2009)

E. Campus Pedestrian Facilities: ADA Assessment and Survey (includes recommended performance standards (pg.29-30) – SZS Consulting Group

3.3 ALTERATIONS TO EXISTING BUILDINGS

A. All of the accessibility construction standards, contained herein, shall apply to existing buildings undergoing alterations unless technically infeasible.

B. The technical infeasibility of alterations shall be jointly determined by OSU's Project Manager and the designer in consultation with the Office of Equity and Inclusion. The Office of Equity and Inclusion has final authority in determining "technical infeasibility."

C. At a minimum, the alterations must include an accessible route connecting all functional areas in the building to nearby accessible parking and pedestrian routes.

D. At least 25% of the alteration cost must be spent on accessibility improvements. (ADA requires 20%, but OSSC requires 25%)

1. Exceptions (as per 2014 OSSC)

a. Alterations limited solely to windows, hardware, operation controls, electrical outlets, and signs

b. Alterations limited solely to mechanical systems, electrical systems, fire protections systems or hazardous material abatement

c. Alternations undertaken solely by the purpose of increasing accessibility.

E. The accessibility improvements shall be prioritized as follows:

1. Parking
2. Accessible entrance
3. Accessible route to the altered area
4. At least one accessible restroom for each sex or a single unisex restroom
5. Accessible telephones
6. Accessible drinking fountains
7. Additional accessible elements

3.4 DESIGN SPECIFICATIONS

A. The following design specifications should be incorporated into all new construction. In alteration work, these specifications should be utilized to the greatest extent feasible.

1. Building Blocks

a. Floor and Ground Surfaces

1) Use hard or resilient flooring in high traffic, general university areas such as lobbies, corridors, restrooms, and other common areas along all accessible routes.

2) Carpet should only be used in areas where it is not a part of an accessible route or in areas where acoustics are a concern, such as in residence halls.

3) Where carpet is used, use only short-pile carpet.

4) At entrances to buildings, provide recessed walk-off mats that are flush with the adjoining floor surface.

5) Pavers or stamped concrete should not be used on accessible paths of travel. Pavers may be used in other areas, but must be set in mortar on a concrete

slab and have flush joints. Stamped concrete, if used, should not have joints larger than 1/8” wide.

b. Turning Space

1) Provide elongated circle minimum turning space (60” x 78”). (ADA allows 60” radius or T-shaped turning area)

2) Only use 60” radius and T-shaped turning space in alterations where space for the elongated circle is not available.

c. Floor and Ground Clear Areas

1) Provide clear floor areas with minimum dimensions of 36” x 54”. (ADA allows 30” x 48”)

d. Knee Space

1) Provide 30” minimum knee space under tables and counters, wherever possible. It is acknowledged that this amount of knee space is not available with lavatories due to lavatory bowls and plumbing. (ADA allows 27” minimum.)

e. Reach Ranges

1) Provide all controls for building occupants between 18” and 43” above the floor. (ADA allows 15” to 48” or up to 44” over counters up to 25” deep.)

2) Controls and objects shall be placed at least 18” away from inside corners of walls to allow for wheelchair access.

3) Locate outlets and other objects that are normally closer to the floor at a consistent height of 18 inches above the floor measured to the centerline of the outlet or object. (ADA allows outlets to be located as low as 15”.)

f. Operable Parts

1) Operable parts intended for public use, such as automatic door operators, emergency call boxes, switches, or controls, shall be designed with a minimum 36” x 54” clear floor or ground space having a maximum slope of 1.5% (1:66.7) in any direction.

B. Exterior Accessible Routes

1. Paths of Travel

a. All projects must connect to the OSU Accessible Travel Grid, an integrated pathway connecting every building with at least one accessible route. OSU Project Managers can provide this map.

b. All projects must consider connections from the project site to accessible parking as well as to accessible routes of travel that connect the building to the rest of campus to ensure that we are creating an integrated campus.

c. When an accessible route of travel needs to be closed for construction purposes, the designer shall direct the contractor to either provide an alternate accessible route or provide signage that directs people to the nearest accessible route.

d. Where an accessible route intersects with multiple routes where one or more routes are not accessible, provide signage directing people to the accessible route.

e. Minimum walkway width: 60” (ADA minimum is 36”.) See Street Standards in Section 34 00 00 Transportation of OSU Construction Standards on required widths of walks.

f. Design accessible exterior routes without ramps whenever possible.

g. Whenever possible, locate items such as cleanouts, vault covers, grates, and similar items outside of the path of travel. When these items are located within the path of travel, they shall be flush with the surrounding walk.

h. For exterior routes, choose alternatives to ramps (such as sidewalks and proper grading) to achieve gentler slopes.

i. Maximum running slope: 1:25 (4%). The ADA allows up to 1:20 (5%).

j. Note: 1:25 (4%) slopes cannot always be met due to existing conditions and grades. Grades up to 1:20 (5%) are allowable where existing conditions prevent lesser grades.

k. Where design slopes on walks approach 1:20 (5%) due to existing conditions, consider the incorporation of a ramp or ramps to provide reduced slopes along the majority of the route. Ramps may be preferred over long stretches of walks at maximum allowable grade.

l. On accessible routes with slope greater than 4%, landings shall be provided at least every 50 feet. Consider the placement of benches or other seating elements at the landings.

m. Maximum cross slope: 1.5% (1:66.7) ADA allows 1:48 or just over 2%. This is to ensure that, with construction tolerances, the resulting slope will be less than 2% (1:48).

n. The specifications or drawing notes should clearly state that any pathways or sidewalks that are constructed with slopes exceeding 2% (1:48) cross slope or 1:20 (5%) running slope shall be replaced at the contractor's expense. Determinations of non-compliant slopes will be at the discretion of OSU Authorized Representative, measured using a two (2)-foot digital level.

o. Along open walkways, provide minimum of 12" of landscaping along edges of walks that are flush with walk or provide edge protection such as a curb. This does not apply to the street side of curbside sidewalks.

p. Bicycle parking should not be located within paths of travel. (See Section 34 00 00).

C. General Site Elements

1. Accessible Parking

a. See Oregon Transportation Commission's (OTC) Standards for Accessible Parking Places. The following shall be supplemental to the OTC standards. Where conflicts exist, the following standards shall prevail.

b. Parking stalls shall be designed to be a minimum 9 ft. wide by 18'-6" deep. (ADA allows 8 ft. wide stalls.)

c. Standard access aisles shall be a minimum of 6 ft. wide (ADA allows minimum of 5 ft.)

d. Access aisles adjacent to van accessible or wheelchair accessible spaces shall be a minimum of 8 ft. wide (ADA allows 8 ft. access aisle with 8 ft. wide parking space or 5 ft. access aisle with 11 ft. wide parking space; OSSC requires minimum of 17 ft. overall.)

e. Both parking spaces and access aisles should be designed with a maximum slope of 1.5% (1:66.7) in any direction. This is to ensure that, with construction tolerances, the resulting spaces and access aisles will be less than 2% (1:48) and still provide enough slope for drainage.

f. The specifications or drawing notes should clearly state that any accessible parking spaces or access aisle slopes that exceed 2% (1:48) shall be replaced at the

contractor's expense. Determinations of non-compliant slopes will be at the discretion of OSU, measured using a 2-foot digital level.

g. All accessible parking spaces and access aisles shall be constructed with concrete to allow for better control of slopes during construction.

h. Parking spaces should be designed to avoid the use of wheel stops, where feasible. Wheel stops can be a tripping hazard. Adjoining walks should be designed to be wide enough so that vehicles overhanging the walk do not impede the accessible route. Where adjoining walks are less than 8 ft. wide, wheel stops should be used to ensure maneuvering clearance is maintained.

i. Curb ramps serving accessible parking spaces shall not receive detectable warning.

j. Accessible routes from parking access aisles should not cross behind vehicles or go into vehicular traffic. In those cases where it is not technically feasible or reasonable to separate access route from vehicular traffic, then the accessible routes shall be clearly marked as accessible pedestrian crossings.

k. Accessible parking signage should not be located within a pedestrian way unless location elsewhere would place the sign too far from the accessible parking space. When it becomes necessary to install an accessible parking sign in a pedestrian way, the bottom of the sign should be at a minimum height of 84".

l. Parking Meters: Coin slots and credit card swipes for accessible parking spaces or pay stations that serve accessible parking spaces shall be located at a height between 24" and 43".

m. Electric Vehicle Charging Stations: An accessible electric vehicle charging station should have all controls at a height between 24" and 43". At least one, but no less than one in each five electric vehicle charging stations in a grouping, shall be accessible.

2. Curb Ramps

a. Provide curb ramps where accessible routes cross curbs and where blended transitions are not provided.

b. Unless limited by existing conditions, provide maximum slope of 1:14 (7.14%) on ramp and flared surfaces.

c. Provide minimum 48" x 48" landing at sidewalk at top of curb ramp. Maximum slope on landings to be 1.5% (1:66.7).

d. Do not install diagonal curb ramps.

e. Maximum gutter counter slope shall be designed at 4.5% (1:22.2). This is to ensure that, with construction tolerances, the resulting gutter counter slope does not exceed 5% (1:20).

f. Minimize the slope at the landing at bottom of the curb ramp to the greatest extent possible. Consider going to a blended transition at intersections where the crown of the existing street creates excessive slope at the gutter line.

g. Do not paint curb ramp surfaces.

h. Provide safety yellow detectable warning on all curb ramps that lead to a vehicular crossing. In general, driveways are excluded unless it is determined that the anticipated volume of traffic entering or exiting a driveway warrants detectable warning.

i. When new curb ramps are installed as part of a project, existing, non-compliant curb ramps shall be replaced on the opposite side of the street, as applicable.

3. Driveways

    a. Driveways that cross sidewalks shall be designed such that:

        1) The sidewalk at the top of the sloped driveway has a maximum cross slope of 1.5% (1:66.7) providing a continuous clear pedestrian access route.

        2) An option for a narrow curb-side sidewalk, although less desirable, would be to provide sloped 1:14 (7.14%) ramps along the sidewalk on either side of the driveway (so the sidewalk is closer to street grade) and slope the driveway up beyond the sidewalk. The sidewalk portion should have a maximum 1.5" (1:66.7) cross slope. (See Diagram 01 10 02A at the end of the Section)

        3) In general, driveways shall not receive detectable warning. At driveways that have high traffic volumes and driveways to large parking lots, detectable warning may be warranted. The Office of Equity and Inclusion shall be consulted to make the determination as to whether or not a driveway is considered high volume.

4. Site Furnishings

    a. Where benches are provided, provide at least one fully accessible bench in each grouping of benches. Where multiple benches are provided, provide at least one accessible bench for each five benches in a grouping or portion thereof.

    b. Provide companion seating adjacent to a minimum of 50% of all benches.

    c. Where picnic tables are provided, provide at least one accessible picnic table in each grouping of picnic tables. Where multiple picnic tables are provided, provide at least one accessible picnic table for each five picnic tables in a grouping or portion thereof.

5. Loading Docks and Service Yards

    a. Whenever feasible, do not design loading docks and service yards where vehicles will encroach onto a sidewalk or pathway. This, though temporary, will cause someone with a disability to backtrack.

    b. Where it is not feasible to avoid encroachment onto a sidewalk or pathway, ensure that another pathway in close proximity exists to get around the vehicle, and ensure that it is easily findable.

D. Interior Accessible Routes

1. Accessible Routes

    a. Minimum width: 60" (ADA minimum is 36".)

    b. Design accessible routes without ramps whenever possible.

    c. Elevators are preferred over ramps wherever level changes greater than three vertical feet are necessary.

    d. Avoid the use of vertical platform lifts in new construction. In existing buildings, vertical platform lifts may be an option for making an area accessible, but should always be the last resort.

    e. Ensure that the lighting levels on ramps and stairs are at least equivalent to the lighting levels in adjacent areas.

2. Interior Ramps

    a. When a ramp is necessary, design the ramp slope between 1:20 (4%) and 1:16 (6.25%). ADA allows 1:12 (8.33%) maximum slope for ramps.

b. Install handrails with a centerline of handrail at 36” above ramp surface. (ADA allows 34” – 38”). Also, include handrail at 26” in locations used primarily or frequently by children.

c. Avoid curved ramps.

d. Where possible, provide a minimum 60” x 72“area at top, bottom, and intermediate landings.

e. Provide continuous handrails around the perimeter of landings.

f. When using steel pipe or tubing, provide minimum wall thickness of .140”.

g. Round handrails are preferred.

3. Interior Stairs

a. Do not design a step with a single riser.

b. Ensure that the leading edge of treads contrasts with the rest of the treads to increase visibility and safety where appropriate. Provide a contrasting strip on the leading edge of the tread that extends a total of 2” back from the leading edge of each tread

c. Install handrails with centerline of handrail at 36” above stair nosings. (ADA allows 34” – 38”.) Also, include handrail at 26” in locations used primarily or frequently by children.

d. OSSC requires that there be handrails within 30” of any portion of a stair that is determined to be an egress route. On stairs that are not part of an egress route, provide intermediate handrail(s) evenly spaced in increments not exceeding 8 feet.

e. Provide 12” horizontal handrail extension at the bottom of stairs providing the extension does not protrude into an accessible route.

f. Provide continuous handrails around the perimeter of landings.

g. When using steel pipe or tubing, provide minimum wall thickness of .140”.

h. Round handrails are preferred.

E. General Building Elements

1. General Design

a. When designing rooms and spaces, include furnishings, trash receptacles, and other moveable objects in the design drawings to make sure these items will not encroach on accessible routes, turning spaces and required clear floor spaces. The design should incorporate space for these items.

b. Building Ingress and Egress

1) Where technically feasible, all public access points to a new building or major remodel/renovation should be made accessible.

2) In those cases where at least 60 percent of all public entrances cannot be made accessible due to technical infeasibility, the Office of Equity and Inclusion will be contacted and will review the design. The Office of Equity and Inclusion has final authority in determining “technical infeasibility.”

3) Provide clear means of egress from all areas of a building.

c. Access to Public Areas

1) In new construction and major renovation work, all public areas must be made accessible including multi-leveled classrooms, sunken areas, loggias, raised platforms, and mezzanines.

d. Doors and Door Openers

1) Provide automatic door operators on all primary entrances to a building.

2) Install infrared sensors, push button controls, proximity card readers and other door control devices at a height of 36”.

3) Provide a clear floor space at these door control devices that is level and located outside the swing of the door.

4) Do not install doors that are narrower than 36” wide. (ADA requires a minimum 32” clear.)

5) Avoid doors that swing out into corridors or accessible routes of travel. Exceptions include classrooms and other spaces that are required to open outward for emergency egress and electrical, telecom, mechanical rooms that are used infrequently. Doors that are required to open out into corridors or public spaces should be designed within alcoves when feasible.

6) Install magnetic hold open devices or high quality automatic door openers on internal doors and fire doors in corridors, and other areas accessible entrances and along accessible routes within buildings.

7) The preferred height for handles, pulls, latches, locks, and other operable parts on accessible doors is 39 inches above the floor.

e. Windows

1) Provide adequate clear floor space at any operable window so that a person can approach and open the windows.

f. Furnishings

1) Where seating, benches, tables and other furnishings are provided, provide a minimum of one accessible unit for every five units or portion thereof.

3.5 PLUMBING ELEMENTS AND FACILITIES

A. Restrooms and Toilet Rooms

1. In new construction and major renovation, all restrooms shall be designed to be fully accessible.

a. All restrooms shall be designed either without doors or have automatic door operators. (See Section 08 71 00 Door Hardware.)

b. In addition to the required restrooms per applicable building code requirements, at least one accessible family or assisted use restroom shall be provided. If only one restroom is provided, then it shall be located on the first floor of the building.

c. All gender inclusive restrooms (sometimes referred to as family, assisted-use, or single-user restrooms) shall be provided with a Camden entry system. (See OSU Construction Standards Section 08 71 00 Door Hardware.)

d. In restrooms that include two or more toilets, provide at least one wheelchair accessible stall and one ambulatory accessible stall.

e. In larger public restrooms containing six or more toilets, provide one wheelchair accessible stall and one ambulatory accessible stall for each six toilet stalls or portion thereof.

f. Provide solid loop toilet seats on accessible toilets, no open front seats.

g. Provide 48 inches minimum clearance between stall doors and any wall or obstruction. (ADA allows 42” for latch side approach.)

h. Install automatic flush valves. Exception: Where dual-flush valves are used, lever controls are acceptable, but must be located in an accessible location.

i. Install toilets so seat height is at 18” (ADA allows 17” – 19”) and centerline of toilet is 17” from wall (ADA allows 16” – 18”).

j. Install grab bars with centerline of grab bar at 34” height. (ADA allows 33” – 36”.)

k. Install vertical grab bar as per ICC A117.1 (new requirement)

2. Lavatories

a. In new construction, make all lavatories accessible.

b. Install automatic faucet controls.

c. Provide tempered water (120 degrees maximum).

3. Urinals

a. Install automatic flush valves.

b. Where urinal partitions exceed 24” in length, provide 36” minimum width clear at urinal.

4. Showers

a. Install roll-in showers that are 42” x 60” minimum. (ADA allows 30” x 60”.)

b. Provide a clear floor space of 36” x 60” minimum outside of transfer shower stalls and 42” x 60” minimum at roll-in shower stalls. (ADA allows 36” x 48” and 30” x 60”, respectively.)

c. Install shower seats at 18” height. (ADA allows 17” to 19”.)

d. Install shower controls at 43” (ADA allows 38” to 48”.)

e. Mount grab bars at 34” (ADA allows 33” to 36”.)

5. Locker Rooms

a. Provide accessible lockers on accessible route.

b. Accessible lockers should be located close to the entrance to locker room and near showers.

c. Accessible lockers should be located within the 18” to 43” reach range and be furnished with lever handles.

d. All locker rooms shall be equipped with an accessible bench.

6. Toilet Accessories

a. Mount toilet paper dispensers below grab bars at 29” and out from the front edge of the toilet centered a distance of 8 inches. (ADA allows 7” – 9”)

b. Mount toilet seat cover dispenser on opposite wall or partition from side grab bar. The opening should be at a maximum height of 43”.

c. Mount fixtures (including hand dryers, paper towel holders, and soap dispensers) with controls at 43”. (ADA allows up to 48”)

d. Locate paper towel dispensers and hand dryers in locations that are not within an accessible route of travel. Consider using a recessed unit that does not protrude from the wall more than 4”. (The OSU standard paper towel dispenser protrudes out from the wall approximately 9 inches and does not comply with ADA requirements if installed with open space below.)

e. The same applies to hand dryers.

f. If provided, install baby changing table so that the front edge is at 34” above the floor.

g. Mount mirrors with bottom edge no higher than 38” above the floor (ADA allows maximum of 40”) Provide full height mirrors, where possible.

7. Drinking Fountains

a. Install dual-height accessible drinking fountains or water coolers near lecture halls, auditoriums and other high-use areas. (Option: two separate units)

b. Provide water bottle fillers on the lower unit.

c. Provide alcoves for drinking fountains. Wheelchair accessible drinking fountains typically extend out from walls. This creates a potential protrusion hazard.

B. Communication Elements and Features

1. Parking Signage

a. See Sect. 01 10 02 - Design Specification for accessible parking signage.

2. Exterior Signage

a. When all entrances are not accessible, provide signage that directs people to the accessible entrances.

b. Accessible entrances shall have the International Symbol of Accessibility (ISA) signage installed.

3. Interior Signage

a. Provide room numbers on all rooms in both raised text and Braille.

b. In addition, provide room names in both raised text and Braille at all permanent rooms (where the name of the room is not expected to change).

c. Visual and tactile signage indicating the floor level should be provided at all stairwells.

d. Provide the International Symbol of Accessibility on all restroom signage. (OSSC does not require the International Symbol of Accessibility if all restrooms are accessible.)

e. Provide Grade 2 Braille on all signage required to have Braille. This is an abbreviated form of Braille.

f. The base of all raised text and Braille is to be located between a height of 48” and 60” (New ADA requirement).

g. Where pictograms are used, raised text and Braille should be located below the pictogram.

h. All doors with automatic door operators should have signage on the door indicating that it is an automatic door. The signage should be on both sides of the door.

4. Tactile Exit Signs – Provide tactile exit signs wherever visual exit signs are required. The tactile exit signs should be located adjacent to the latch side of doors or openings at a height between 48” and 60”. Exit signs shall be provided as follows:

a. "EXIT" where exit signs lead to a safe exterior space.

b. "EXIT STAIR DOWN (or UP)" where exit signs lead to stairs leading to an exit.

c. "EXIT RAMP DOWN (or UP)" where exit signs lead to ramps leading to an exit.

d. “EXIT ROUTE” at locations where lit exit signs direct a person to an exit but not directly to a safe exterior space.

5. Fire Alarm Systems
    a. Fire alarm strobes shall be located such that no two strobes are visible from the same location.
    b. If due to Fire Code requirements, fire alarm strobes need to be located such that two or more strobes are visible from the same location, extra precaution should be taken to ensure that the strobes are perfectly synchronized.
6. Assistive Listening Systems
    a. Where sound systems are provided, assistive listening devices shall be installed as part of the system.
    b. At least 25%, but no fewer than 2 receivers shall be hearing aid compatible.
    c. The assistive listening system shall be as specified by the OSU Office of Academic Technologies – Classroom Technologies, and Disability Access Services.
7. Special Rooms, Spaces, and Elements
    a. Classrooms
        1) Design classrooms without ramps or lifts, whenever feasible.
        2) The slope of walking surfaces shall not exceed 1:20.
        3) If elevated stages are provided, they shall be on an accessible route internal to the classroom.
        4) Provide a minimum of 42” clearance between aisles that lead to accessible seating.
        5) Wheelchair accessible spaces should be adjacent to an accessible route.
        6) A clear line of sight to the instructor and media shall be provided at wheelchair accessible spaces.
        7) In classrooms with occupancy of 100 or more, wheelchair and accessible seating should be dispersed to provide a variety of viewing angles. Where fixed furniture is installed, wheelchair accessible seating shall be dispersed to the top, middle, and bottom of the classroom.
        8) All accessible spaces and furniture shall be provided with signage indicating that the space is reserved for people with disabilities.
        9) Spaces for wheelchair users should be a minimum of 36” wide by 48” deep (60” deep, if side access).
        10) Classroom Furniture shall comply with Section 12 56 33: Accessible Classroom Furniture.
    b. Kitchens
        1) Where kitchen ranges or stove tops are installed, provide units with controls located near the front of the units.
        2) Where a microwave is provided, locate the unit such that the microwave door and all controls are located at a height not exceeding 43” in height.
        3) At kitchen counters, sink faucet controls shall be located within 20” of the front edge of the counter. Consider side mounted controls located within 16” of the front edge of the counter where feasible.

END OF SECTION

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. Project consists of interior renovations of three separate areas in Dixon Recreation Center located on the first and second floor.

1. West Entry, Sports Programs, and Fitness and Wellness: Work includes new control desk at west entry, reconfiguration of office layout in sports programs suite, and creation of new fitness and wellness office suite. Finishes and systems, including HVAC, lighting, fire protection, and fire alarm, will up updated throughout area of work.
2. Mind Body Studio: Work includes finish and systems updates, including HVAC, lighting, fire protection, and fire alarm, and minor floor plan reconfigurations.
3. Administrative Suite: Work includes addition of two enclosed offices, and finish and systems updates, including HVAC, lighting, fire protection, and fire alarm.

B. Work shall be started within ten (10) calendar days after signing of Contract on behalf of Oregon State University. The Contract may not be signed prior to approval of the Contractor's Certificate of Insurance by Construction Contract Administration (CPCA), Oregon State University.

1.2 CONTRACTORS USE OF PREMISES

A. Contractor shall limit use of the Premises for work and storage to allow for:

1. Owner occupancy, day and night.
2. Public access as required by Tenant during the day.
3. Security.
4. Safe entry and exit for vehicles and pedestrians.
5. Fire egress.

B. Coordinate all operations with the Owner's Authorized Representative during the construction period. A ninety-six (96) hour notification is required prior to scheduled utility shutdowns or street closures, but more lead time is often required to schedule around other critical activities.

C. Limit Contractor's employee parking to locations designated at the Pre-construction Conference.

1.3 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours as set forth by the University. Work that generates significant noise and vibration shall be conducted after hours on weekdays (after 5:00 pm) or on weekends.

1.4 OWNER OCCUPANCY

A. The Owner, Owner Tenants, will occupy the Premises during the entire period of construction for the conduct of normal operations. Cooperate with Owner's Authorized Representative in construction operations to minimize conflict and to facilitate the Owner's usage especially in the following areas:

1. Restricted access Tenant Areas and parking.
2. Storage space access and availability.

B. Conduct operations in such a way to ensure the least inconvenience to the Tenants and general public, including:

1. Limitations and easements.
2. Emergency vehicle access.
3. Building access to the public, day and night.

1.5 ASBESTOS AND OTHER HAZARDOUS MATERIAL

A. The Owner has made a reasonable attempt to locate and identify asbestos or other hazardous material that may be encountered during the course of the Work.

B. If the Contractor observes or suspects the existence of asbestos, polychlorinated biphenyl (PCB) or other hazardous materials in the structure or components of the building, the Contractor shall immediately stop work and notify the Owner's Authorized Representative.

C. The Owner will arrange for the removal of asbestos, polychlorinated biphenyl (PCB) or other hazardous materials as required by Facilities Services personnel or by separate contract.

D. Schedule ten (10) days of slack or "down" time for the removal of hazardous materials without penalty to Owner for the delay of the Contract.

1.6 LEAD BASED PAINT

A. The Owner may have tested existing paint in the project area and if levels are found the following conditions apply.

B. Contractor shall remove paint as specified for surface preparation and capture removed material for disposal.

C. Contractor shall follow OSHA guidelines involving exposure to workers.

D. Owner will provide containers for Contractor's use at project site.

E. Contractor shall comply with the requirements of DEQ and EPA and shall submit a lead abatement plan.

F. Contractor shall separate lead contaminated material from effluent and water.

G. Owner will dispose of lead paint and effluent resulting from stripping operation.

H. Soil contaminated by stripping operations shall be replaced with topsoil.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 24 76 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work of this Section includes forms and procedures for progress payments.

B. Related work specified elsewhere.

1. For the primary discussion of payments, refer to OSU General Conditions, Section E, as supplemented.

2. In compliance with OSU General Conditions, Section K, no payments beyond 75% will be made by the Owner before two complete copies of the draft Operation and Maintenance Manuals have been received for review by the Owner.

1.2 APPLICATION FORMS

A. For applications for payment, use sample contract payment request on company letterhead, or AIA Document G702, supported by AIA Document G703, Continuation Sheet, or similar document.

B. Prepare the Schedule of Values in such a manner that each major item of Work and each subcontracted item of Work is shown as a line item broken down in terms of material and labor costs on AIA Document G703, Application Certification of Payment, Continuation Sheet or similar format. The sample continuation sheet shall be the minimum Schedule of Values breakdown.

C. The Schedule of Values shall be submitted for review by the Owner prior to the first application for payment; and may be used when, and only when, accepted in writing by the Owner.

D. Payment request is to include the Contractor's Federal Tax Identification number and return address.

1.3 PAYMENTS

A. The Owner will make progress payments on account of the Contract once monthly for the scheduled duration of the project (i.e. three (3) payments on a three-month project), based on the value of work accomplished or materials on the job site, as stated in the Schedule of Values on the Application and Certificate Payment.

B. Notwithstanding the foregoing, as this project is scheduled to take six (6) months to complete, Owner will only make six (6) payments, plus a final retainage payment, as applicable.

C. Complete and forward Application to the Owner on or about the 15th day of each month for work performed the previous month and include certified payroll statements as specified in the OSU General Conditions.

D. Submit one (1) copy of forms requesting payment to the Owner.

E. Payments will be made on protected materials on hand at the job site properly stored, protected, and insured.

F. Estimated quantities shall be subject to the Owner's review and judgment.

1.4 EARLY PURCHASE AND PAYMENT OF MATERIALS AND EQUIPMENT

A. Order materials and equipment requiring a long lead or waiting time early so as not to delay progress of the Work.

B. The Contractor will be reimbursed for early order materials or equipment upon receipt and verification of quality and quantity against submittals and shipping documents by the Owner's Authorized Representative.

C. Receipt shall be to the job site or stored at Owner's other premises in an orderly and safe manner, secured from normal weather damage.

D. Security remains the responsibility of the Contractor.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 24 76.01 - CONTRACT PAYMENT REQUEST

DATE: _____

TO: Administrative Services Accounting
Oregon State University
850 SW 35th Street
Corvallis, OR 97333

Payment Request No. _____Contract No. _____ Period from _____ to _____

Project: _____

Original Contract Amount .....$_____

Change Orders (Net Amount).....$_____

Contract Total to Date .....$_____

==========

Total Completed and Stored to Date.....$_____

Less retainage (5%), if applicable .....$_____

Total Earned, Less Retainage (if applicable) .....$_____

Less Previous Payments.....$_____

Net Amount Due this Request.....$_____

The undersigned Contractor certifies that, to the best of his/her knowledge, information, and belief, the Work covered by this request has been completed in accordance with the Contract Documents, that all amounts have been paid for Work for which previous applications for Payment were issued and payments received from the Owner, and that the amount shown herein is now due.

Contractor:_____

By: _____Date: _____

Federal Tax ID Number:_____

Address:_____

_____

END OF SECTION

SECTION 01 24 76.02 - CONTINUATION SHEET

Project Name:

Application No.:

Date:

Period To:

WRN No.:

NOTES:

Amounts are stated to the nearest dollar.
Use Column I on Contracts where variable retainage for line items may apply, or if retainage is required.

Change Orders are usually listed as the last items of the basic schedule.

A	B	C	D	E	F	G		H	I
Item No.	Description of work	Scheduled Value	Work Completed		Materials Presently Stored (Not in D or E)	TOTAL Completed & Stored (D+E+F)	% Completed (G/C)	Balance to Finish (C-G)	Retainage
			From Previous Applications	This Period					
TOTALS									

END OF SECTION

SECTION 01 25 00 - PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General requirements for the Work in relation to substitutions and product options.

B. Submit to the Owner's property insurance carrier shop drawings, samples, and product data (such as manufacturer's standard schematic drawings and other literature) when required by individual Specifications sections.

C. Related Work Specified Elsewhere

1. Instructions to Bidders.
2. OSU General Conditions.

1.2 REQUESTS FOR SUBSTITUTIONS

A. Requests for substitution of products in place of those specified shall be in accordance with Instructions to Bidders, and as specified herein.

1.3 CONTRACTOR'S RESPONSIBILITIES

A. Investigate proposed products and determine that they are equal or superior in all respects to products specified.

B. Provide same guarantee for accepted substitutions as for products specified.

C. Coordinate installation of accepted substitutions into the Work, making such changes as may be required for the Work to be complete in all respects.

1.4 SUBSTITUTIONS DURING BIDDING

A. Submit two (2) copies of the following information with each request to the Owner:

1. CSI substitution request form.
2. Comparison of proposed substitution with product, material or system specified.
3. Complete data, substantiating compliance of proposed substitution with the Contract Documents.
4. Test numbers and supporting reports, indicating compliance with referenced standards.
5. Evidence that warranty requirements are acceptable.
6. Details indicating specific deviations proposed for the substitution.
7. Reference and applicable Specification sections.
8. Applicable product samples.

B. All substitution requests shall be received in the Owner's office no less than five (5) calendar days before bid opening. Requests received after this date will not be considered.

1.5 SUBSTITUTIONS DURING CONSTRUCTION

A. Substitutions will normally not be considered after date of Contract except when required due to unforeseen circumstances.

B. Within a period of thirty (30) days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified, when submitted in accordance with the requirements stipulated herein.

C. One or more of the following conditions must be documented in any such request:

1. Required for compliance with final interpretation of code or insurance requirements.

2. Required due to unavailability of a specified product.

3. Required because of the inability of the specified product to perform properly or to fit in the designated space.

4. Substitution would be substantially in the best interest of the Owner in terms of cost, time, or other considerations.

1.6 SUBSTITUTIONS NOT PERMITTED

A. If implied on submittals without first requesting approval thereof.

B. If acceptance will require substantial revision of the Contract Documents.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

S U B S T I T U T I O N R E Q U E S T F O R M
For Substitution Requests Prior to Bidding

Advancement of Construction Technology
The Construction Specifications Institute

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Section	Page	Paragraph	Description

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

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

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

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

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by:

Signature _____

Firm _____

Address: _____

_____

Date: _____

Telephone: _____

For use by Design Consultant:

☐ Accepted ☐ Accepted as noted
☐ Not Accepted ☐ Received too late

By: _____

Date: _____

Remarks: _____

Attachments: _____

S U B S T I T U T I O N R E Q U E S T F O R M
For Substitution Requests During Construction Administration

Advancement of Construction Technology
The Construction Specifications Institute

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Section	Page	Paragraph	Description

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

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

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

Substitutions for After Bidding: The undersigned states that the substitution is requested DUE TO AT LEAST ONE of the following conditions (indicate and substantiate condition in attachments; failure to identify one of these conditions will result in rejection of the substitution):

1. Specified product is no longer available.
2. Specified product is no longer compatible, due to changes in the design during construction.
3. A change in governing regulatory requirements makes a revision in design or material usage mandatory.
4. Substitution offers the owner a substantial advantage in cost, time, energy conservation, or other consideration (provide substantiation for review).

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by:

Signature _____

Firm _____

Address: _____

_____

Date: _____

Telephone: _____

For use by Design Consultant:

☐ Accepted ☐ Accepted as noted
☐ Revise and Resubmit ☐ Not Accepted

By: _____

Date: _____

Remarks: _____

Attachments: _____

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Digital project management procedures.
5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 01 31 19 “Project Meetings” for preparing, facilitating and documenting meetings
2. Section 01 61 16 "Delegated Design Requirements" for Bidder/Design/Build or delegated systems design requirements
3. Section 01 77 00 "Contact Closeout" for coordinating closeout of the Contract.
4. Section 31 20 00 “Earth Moving” for delegated design soil retainage.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary 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. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within fifteen (15) working 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 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, in web-based Project

software directory, and in prominent location in each completed facility. Keep list current at all times.

1.5 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 own operations with 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 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.

4. If a Project Coordinator has been retained by the Owner or the General Contractor, each contractor shall cooperate with the Project Coordinator, who shall coordinate construction operations with those of other contractors and entities.

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 if coordination of their Work is required.

D. Administrative Procedure for Projects with a Single Contract: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. If a Project coordinator has been retained by the Owner or the General Contractor, coordinate with the Project coordinator’s direction. 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. Preinstallation conferences.

7. Project closeout activities.

8. Startup and adjustment of systems.

E. Administrative Procedures for Projects with Multiple Contracts: Coordinate scheduling and timing

of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. If a Project coordinator has been retained by the Owner or the General Contractor, coordinate with the Project coordinator's direction. 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. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated 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 coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

    c. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

    d. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

    e. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

    f. Show location and size of access doors required for access to concealed dampers, valves, and other controls.

    g. Indicate required installation sequences.

    h. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination 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 subframing for support of ceiling[**, raised access floor,**] and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
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.
    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 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, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "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 Preparation Format: DWG Version AutoCAD 2018, Revit 2018 operating in Microsoft Windows operating system.

3. File Submittal Format: Submit or post coordination drawing files using same as File Preparation Format and PDF Format

4. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.

   a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.

5. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

   a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.

   b. Digital Data Software Program: Drawings are available in <Insert name and version of digital data software program and operating system>.

   c. Contractor shall execute a data licensing agreement in the form of [AIA Document C106] [Agreement included in this Project Manual] [Agreement form acceptable to Owner and Architect].

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

   1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.

   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 Architect

   6. RFI number, numbered 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, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven 7 working days for Architect's response for each RFI.

1. The following Contractor-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 means and methods.

d. Requests for coordination information already indicated in the Contract Documents.

e. Requests for adjustments in the Contract Time or the Contract Sum.

f. Requests for interpretation of Architect's actions on submittals.

g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect or of additional information.

3. Architect'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 01 26 00 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within seven (7) 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 weekly prior to Project Meeting. Include the following:

1. Project name.

2. Name and address of Contractor.

3. Name and address of Architect**.**

4. RFI number including RFIs that were returned without action or withdrawn.

5. RFI description.

6. Date the RFI was submitted.

7. Date Architect's response was received.

8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven **(7)** days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model, CAD drawings will

be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD 2018, Revit 2018 and version of digital drawing software program and operating system.
4. Contractor shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
    a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
5. The following digital data files will be furnished for each appropriate discipline:
    a. Floor plans.
    b. Reflected ceiling plans.

B. Web-Based Project Software: Provide, administer, and use web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project software site includes, at a minimum, the following features:
    a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    c. Document workflow planning, allowing customization of workflow between project entities.
    d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    e. Track status of each Project communication in real time, and log time and date when responses are provided.
    f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    g. Processing and tracking of payment applications.
    h. Processing and tracking of contract modifications.
    i. Creating and distributing meeting minutes.
    j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    k. Management of construction progress photographs.
    l. Mobile device compatibility, including smartphones and tablets.
    m. <Insert description of software feature>.
2. Provide up to seven 7 web-based Project software user licenses for use of Owner, Architect, and Architect's consultants. Provide necessary software training for web-based

Project software users.

3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.

3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three 3 days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **seven (7)** days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress. Refer to Section 01 31 19 Project Meetings

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes with in three (3) days.

C. Sustainable Design Requirements Coordination Conference: Owner will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner, Architect, and Contractor.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect meeting sustainable design requirements, including the following:

a. Sustainable design Project checklist.

b. General requirements for sustainable design-related procurement and documentation.

c. Project closeout requirements and sustainable design certification procedures.

d. Role of sustainable design coordinator.

e. Construction waste management.

f. Construction operations and sustainable design requirements and restrictions.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

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 installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.

b. Options.

c. Related RFIs.

d. Related Change Orders.

e. Purchases.

f. Deliveries.

g. Submittals.

h. Sustainable design requirements.

i. Review of mockups.

j. Possible conflicts.

k. Compatibility requirements.

l. Time schedules.

m. Weather limitations.

n. Manufacturer's written instructions.

o. Warranty requirements.

p. Compatibility of materials.

q. Acceptability of substrates.

r. Temporary facilities and controls.

s. Space and access limitations.

t. Regulations of authorities having jurisdiction.

u. Testing and inspecting requirements.

v. Installation procedures.

w. Coordination with other work.

x. Required performance results.

y. Protection of adjacent work.

z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, 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.

E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than **(30) thirty** days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of Record Documents.

b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.

c. Procedures for completing and archiving web-based Project software site data files.

d. Submittal of written warranties.

e. Requirements for completing sustainable design documentation.

f. Requirements for preparing operations and maintenance data.

g. Requirements for delivery of material samples, attic stock, and spare parts.

h. Requirements for demonstration and training.

i. Preparation of Contractor's punch list.

j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.

k. Submittal procedures.

l. Coordination of separate contracts.

m. Owner's partial occupancy requirements.

n. Installation of Owner's furniture, fixtures, and equipment.

o. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

F. Progress Meetings: Conduct progress meetings at weekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.

2. Attendees: In addition to representatives of Owner, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in

planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

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. Refer to Section 01 31 19 Project Meetings

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information in three (3) days.

G. Coordination Meetings: Conduct Project coordination meetings at the necessary intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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.

b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.

2) Sequence of operations.

3) Retain first subparagraph below if Project uses BIM in construction stage.

4) Resolution of BIM component conflicts.

5) Status of submittals.

6) Deliveries.

7) Off-site fabrication.

8) Access.

9) Site use.

10) Temporary facilities and controls.

11) Work hours.

12) Hazards and risks.

13) Progress cleaning.

14) Quality and work standards.

15) Status of RFIs.

16) Proposal Requests.

17) Change Orders.

18) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

SECTION 01 31 19 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRE-CONSTRUCTION MEETING

A. Architect/Engineer/Designer, Contractor and Owner will meet prior to start of the Work (within seven (7) days after notice to proceed) to discuss at least the following topics and any others of mutual interest.

1. Schedule of Values
2. Permit Status/tree protection/erosion control
3. List of sub-contractors
4. Job inspections.
5. Early purchase of, and/or lead time requirements for material and equipment/ pre-purchase of equipment
6. Monthly payment date/SOP for pay requests
7. Portion of site to be occupied by construction.
8. Parking/Staging areas
9. Non-smoking campus requirements
10. Maintenance of access and safety.
11. Processing of field decisions and change orders
12. Labor provisions/labor rates for subs
13. Material submittals/deferred submittals
14. Owner access during construction.
15. Review of Contract Documents/review ADA requirements/cross-slopes
16. Coordination procedures and separate contracts.
17. Progress schedules.
18. Critical Work sequencing.
19. Safety and emergency procedures/24-hour contact numbers
20. Security procedures.
21. Hazardous materials.
22. Progress meetings.
23. Contract close-out.

B. Location of Meeting: Project site

1.2 PROGRESS MEETINGS

A. The Contractor will schedule and administer progress meetings and will:

1. Prepare agendas.
2. Schedule progress meetings, frequency, time and day to be determined during pre-construction meeting.
3. Make physical arrangements for and preside at meetings.

4. Record minutes and include decisions.
5. Distribute copies of minutes to participants within four (4) days after meetings.

B. Location of Meetings: Project site.

C. Attendance:

1. The Owner or Owner's Authorized Representative.
2. Contractor.
3. Subcontractors affected by agenda.
4. Project Architect/Engineer/as necessary.
5. Owner will attend meeting to ascertain Work is expedited consistent with progress schedule and with Contract Documents.

D. Minimum Agenda:

1. Review and approve minutes from previous meeting.
2. Review Work progress since previous meeting.
3. Discuss field observations, and problems.
4. Review delivery schedules, construction schedule, and identify problems which impede planned progress.
5. Review proposed changes.
6. Material submittals.
7. Note all new subcontractors performing Work at the job site.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 01 25 76 "Applications for Payment" for submitting Applications for Payment and the schedule of values.
2. Section 01 31 00 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 01 45 00 “Quality Control” for submitting test and inspection reports, and schedule of tests and inspections.
4. Section 01 77 00 "Contract Closeout" for submitting closeout submittals and maintenance material submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

a. Scheduled date for first submittal.

b. Specification Section number and title.

c. Submittal Category: Action; informational.

d. Name of subcontractor.

e. Description of the Work covered.

f. Scheduled date for Architect's final release or approval.

g. Scheduled dates for purchasing.

h. Scheduled date of fabrication.

i. Scheduled dates for installation.

j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.

2. Date.

3. Name of Architect.

4. Name of Construction Manager.

5. Name of Contractor.

6. Name of firm or entity that prepared submittal.

7. Names of subcontractor, manufacturer, and supplier.

8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier, and alphanumeric suffix for resubmittals.

9. Category and type of submittal.

10. Submittal purpose and description.

11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.

12. Drawing number and detail references, as appropriate.

13. Indication of full or partial submittal.

14. Location(s) where product is to be installed, as appropriate.

15. Other necessary identification.

16. Remarks.

17. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.

2. Provide a space approximately **3** by 6 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

3. Action Submittals: Submit one (1) electronic copy of each submittal unless otherwise indicated.

4. Informational Submittals: Submit one (1) electronic copy of each submittal unless otherwise indicated. Architect will not return copies.

5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using agreed upon transmittal form.

E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

F. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

2. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow fourteen (14) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow seven (**7**) days for review of each resubmittal.

4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty one (21) days for initial review of each submittal.

5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow fourteen (14) for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.

b. Manufacturer's product specifications.

c. Standard color charts.

d. Statement of compliance with specified referenced standards.

e. Testing by recognized testing agency.

f. Application of testing agency labels and seals.

g. Notation of coordination requirements.

h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams that show factory-installed wiring.

b. Printed performance curves.

c. Operational range diagrams.

d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.

b. Schedules.

c. Compliance with specified standards.

d. Notation of coordination requirements.

e. Notation of dimensions established by field measurement.

f. Relationship and attachment to adjoining construction clearly indicated.

g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8.5 by 11 inches, but no larger than 30 by 42 inches.

a. One electronic copy of each submittal to Architect

3. BIM Incorporation: [**Develop and incorporate**] [**Construction Manager will incorporate Contractor's**] Shop Drawing files into BIM established for Project.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

a. Project name and submittal number.

b. Generic description of Sample.

c. Product name and name of manufacturer.

d. Sample source.

e. Number and title of applicable Specification Section.

f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.

4. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.

5. Paper Transmittal: Include paper transmittal including complete submittal information indicated.

6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one (1) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three (3) sets of Samples. Architect will retain two (2) sets; remainder will be returned.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.

2. Manufacturer and product name, and model number if applicable.

3. Number and name of room or space.

4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.

2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

a. Name of evaluation organization.

b. Date of evaluation.

c. Time period when report is in effect.

d. Product and manufacturers' names.

e. Description of product.

f. Test procedures and results.

g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM Incorporation: Incorporate delegated-design drawing and data files into BIM established for Project.

1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings. REVIT 2018.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect].

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'SREVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required**,** and return it.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action .

2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

3. Submittals by Web-Based Project Software: Architect will indicate, on Project software website, the appropriate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION 01 33 00

SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, SAMPLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Submit to the Owner shop drawings, samples, and product data (such as manufacturer's standard schematic drawings and other literature) when required by individual Specifications sections.

B. Related Work Specified Elsewhere

1. Instructions to Bidders.
2. OSU General Conditions.

1.2 SUBMITTAL SCHEDULING

A. Submittal Schedule: Contractor shall provide a Submittal Schedule to the Owner and Architect within seven (7) calendar days following the Pre-Construction Conference.

B. For items requiring review by the Owner only, submittals shall be sent to the Owner at least fifteen (15) calendar days before the date each is required for fabrication or installation.

C. Submittals to be reviewed by Owner's consultants shall be sent to the Owner at least twenty (20) calendar days before the date each is required for fabrication or installation.

D. Submittals to be reviewed by Owner's property insurance carrier shall be sent to Owner as directed in individual specification sections.

E. Submittals involving Substitution requests or other modifications requiring review by the Owner and/or the Owner's consultants shall be sent to the Owner at least twenty (20) calendar days before the date each is required for fabrication or installation.

1.3 SUBMITTAL CONTENT AND FORMAT

A. General Requirements:

1. Shop Drawings: Submit in electronic format and, if requested by Owner's Authorized Representative, submit one (1) reproducible transparency and one (1) print of each drawing.
2. Product Data: Submit electronically, and if requested by Owner's Authorized Representative, up to six (6) hard copies.
3. Samples: Submit the number and type stated in each Specification Section. Submit a minimum of three (3) sets of material and color samples where material and color selection is required.
4. Submittals shall include:
    a. Date and revision dates return date requested.
    b. Project title and number.
    c. The names of the Contractor, subcontractor, supplier, and manufacturer.
    d. Identification of product or material, with Specification Section number.
    e. Relation to adjacent critical features of work or materials.
    f. Field dimensions are to be clearly identified as such.
    g. Applicable standards, such as ASTM number or Federal Specification.

h. Identification of deviations from Contract Documents, and for products accompanied by Substitution request as required by Section 01 25 00 “Product Substitution Procedures”.

i. Contractor’s stamp legibly signed, shall essentially read as follows:

1) The undersigned, acting on behalf of the Contractor, certifies that this submittal has been reviewed and is approved; products have been verified as being as specified, field measurements and field construction criteria have been or will be coordinated, and the submittal is in compliance with Contract Documents.

5. Re-submission Requirements:

a. Revise initial drawings as required and resubmit as specified for initial submittal.

b. Indicate on drawings any changes which have been made other than those requested by the Owner or the owner’s consultants.

6. The Owner may return without review any submittal not meeting the requirements listed above.

B. Shop Drawings:

1. Present data in a clear and thorough manner.

2. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Documents.

3. Structural items shall be identified by location in the completed structure. Identify details by reference to contract sheet and detail numbers.

4. Minimum sheet Size: 8-1/2 x 11 inches.

C. Product Data:

1. Manufacturer’s catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:

a. Clearly mark each copy to identify pertinent product or models.

b. Show dimensions, weights, and clearances required.

c. Show performance data consisting of capabilities, ROM, KW, pressure drops, design characteristics and consumption; conforming as closely as possible to the test methods referenced in the Plans and Specifications.

d. Show wiring or piping diagrams and controls.

2. Manufacturer’s standard schematic drawings and diagrams:

a. Modify to delete information which is not applicable.

b. Supplement standard information to provide information specifically applicable to the Work.

D. Samples:

1. Insure that samples are of sufficient size to indicate the general visual effect or color.

2. Where samples must show a range of color, texture, finish, graining, or other property, submit sets of pairs illustrating the full scope of this range.

3. One (1) sample or one (1) set of approved samples will be retained by the Owner; final work will be measured against approved samples.

1.4 QUALITY ASSURANCE

A. Process submittals in ample time for review, as applicable, so as to not delay the Work. All submittals shall be received by the Owner within ten (10) days after pre-construction.

1.5 DEFINITIONS

A. The Owner will mark reviewed materials as follows:

1. “No Exception Taken,” which means fabrication, manufacture and/or installation may proceed.
2. “Make Revisions Noted,” which means fabrication, manufacture and/or installation may proceed with revisions as noted.
3. “Revise and Resubmit,” which means that fabrication, manufacture and/or installation may not proceed.
4. “Rejected,” which means do not proceed; make arrangements for the review of the proposed Work with the Owner as soon as possible.

1.6 PROCESSING

A. Review submittals, make necessary corrections, and become familiar with the content of the submittals.

B. Mark each item with Contractor’s stamp.

C. Accompany submittals with a transmittal letter bearing the project name, Contractor’s name, number of items, and other pertinent data.

D. Keep one copy of each reviewed submittal on the job site at all times.

E. Be responsible for obtaining and distributing prints of shop drawings to the various suppliers, and the Owner once review process has been completed. Make prints of reviewed shop drawings only from transparencies which carry the appropriate stamp and endorsement.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 42 13 - ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Words which may be found elsewhere in the Project Manual and Drawings are abbreviated in accordance with the standards set forth in the following table:

A/C	air conditioning
AB	anchor bolt
AC	asphaltic concrete
ACT	acoustical tile
AD	area drain
ADD	addendum
ADD'L	additional
ADH	adhesive
AFF	above finish floor
AGG	aggregate
AL	aluminum
ALLOW	allowable
ALT	alternate
ANOD	anodized
AP	access panel
APPRX	approximate
ARCH	architect(ural)
ASPH	asphalt
AUTO	automatic
AVE	avenue
BD	board
BIT	bituminous
BLDG	building
BLKG	blocking
BM	bench mark, beam(s)
BOT	bottom
BRZ	bronze
BS	both side
CB	catch basin
CEM	cement
CF	cubic foot
CFOI	contractor furnished owner installed
CG	corner guard
CH	ceiling height
CI	cast iron
CJ	control joint
CKBD	chalkboard
CL	centerline
CLG	ceiling
CLR	clear(ance)
CM	construction manager
CMT	ceramic mosaic (tile)
CMU	concrete masonry unit
COL	column
COM	communications
CONC	concrete
CONN	connect(ion)
CONST	construction
CONT	continuous or continue
CONTR	contract(or)
CPT	carpet
CRS	course(s)
CS	countersink
CSMT	casement
CT	ceramic tile
CTR	center
CVG	clear vertical grain
CW	cold water
CWT	ceramic wall tile
CY	cubic yard
D	depth
DEMO	demolish, demolition
DEP	depressed
DF	drinking fountain
DIA	diameter
DIAG	diagonal
DIM	dimension
DISP	dispenser
DIV	division
DL	dead load
DMT	demountable
DN	down
DP	dampproofing
DR	door
DS	downspout
DT	drain tile
DTL	detail
DW	dumbwaiter
DWG	drawing(s)
DWR	drawer
EA	each
EB	expansion bolt
EF	each face
EJ	expansion joint
EL	elevation

ELEC	electric(al)
EMBED	embedment
EMER	emergency
ENCL	enclose(ure)
EP	electrical panel board
EQ	equal
EQUIP	equipment
EST	estimate
EVT	equiviscous temperature
EW	each way
EWC	electric water cooler
EX.EXIT	existing
EXH	exhaust
EXP	exposed
EXT	exterior
FA	fire alarm
FAF	fluid applied flooring
FARF	fluid applied resilient floor
FAS	fasten, fastener
FBD	fiberboard
FBT	finished blowing temperature
FD	floor drain, fire damper
FE	fire extinguisher
FEC	fire extinguisher cabinet
FF	factory finish
FGL	fiberglass
FHMS	flathead machine screw
FHWS	flathead wood screw
FIN	finish(ed)
FLCO	floor cleanout
FLR	floor(ing)
FLUR	fluorescent
FND	foundation
FOC	face of concrete
FOIC	furnished by owner/installed by contractor
FOIO	furnished by owner/installed by owner
FOM	face of masonry
FP	fireproofing, flash point
FPHB	freeze-proof hose bib
FR	fire resistive, fire rated
FRM	frame(d), (ing)
FS	full size
FSS	finished structural slab
FT	foot
FTG	footing
FTS	finished topping slab
GA	gage, gauge
GALV	galvanized
GB	grab bar or gypsum board
GC	general contractor
GI	galvanized iron
GL	glass, glazing
GLS	glass resin wall surfacing
GP	gypsum
HB	hose bib
HBD	hardboard
HC	hollow core
HD	heavy duty
HDR	header
HDW	hardware
HM	hollow metal
HOR	horizontal
HP	high point
HR	hour
HT	height
HTG	heating
HVAC	heating, ventilating, air conditioning
HWD	hardwood
HWH	hot water heater
ID	inside diameter, identification
IN	inch
INCIN	incinerator
INCL	include(d), ion)
INT	interior
INV	invert
JB	junction box
JC	janitor’s closet
JT	joint
KD	kiln dried
KCP	Keene’s cement plaster
KO	knockout
KP	kick plate
LAB	laboratory
LAM	laminate(d)
LAV	lavatory
LBS	pounds
LH	left hand
LL	live load
LONGIT	longitudinal
LP	low point
LW	lightweight
MAX	maximum
MB	machine bolt
M. MECH	mechanic(al)
MFR	manufacture(r)
MH	manhole

Min	minimum, minute
MISC	miscellaneous
MO	masonry opening
MO#	model number
MOD	modular
MPH	miles per hour
MS	machine screw
MTL	metal
MULL	mullion
MWP	membrane waterproofing
NAT	natural, natural finish
NIC	not in contract
NO	number
NOM	nominal
NTS	not to scale
OA	overall
OBS	obscure
OC	on center(s)
OD	outside diameter
OF	overflow
OFCI	owner furnished contractor installed
OFOI	owner furnished owner installed
OHMS	ovalhead machine screw
OHWS	ovalhead wood screw
OPG	opening
OPP	opposite
OZ	ounce(s)
P	paint(ed)
PB	push button
PCF	pounds per cubic foot
PCP	putting coat plaster
PERF	perforate(d)
PL	plate, property line
PLAM	plastic laminate
PLAS	plaster
PNL	panel
PP	push plate
PR	pair
PREP	prepare
PSF	pounds per square foot
PSI	pounds per square inch
PT	point, pressure treated
PTN	partition
PVC	polyvinyl chloride
PWD	plywood
QT	quarry tile
R	rise
RA	return air
RAD	radius
RCP	reflected ceiling plan
RD	roof drain
REF	reference
REFR	refrigerator
REINF	reinforce(ing)
REQ	required
RET'G	retaining
REV	revision(s), revised
RH	right had
RM	room
RO	rough opening
RSF	resilient sheet flooring
SC	solid core
SCHED	schedule
SEC	section
SF	square feet (foot)
SHT	sheet
SHTHG	sheathing
SIM	similar
SL	sleeve
SOG	slab on grade
SPEC	specification(s)
SQ	square
SS	storm sewer
S4S	finished 4 sides
SD	storm drain
ST	steel, street
ST ST	stainless steel
STD	standard
STR	structural
SUPP	supplement
SUPT	support
SUSP	suspended
SV	sheet vinyl
T	tread
TBM	top bench mark
T&G	tongue and groove
TB	towel bar
TC	top of curb
TEL	telephone
TEMP	tempered
THK	thickness
TKBD	tackboard
TO	top of
TP	top of paving
TRANS	transverse
TS	top of slab
TV	television
TW	top of wall
TYP	typical

UNO	unless noted otherwise
VAT	vinyl asbestos tile
VB	vapor barrier
VCT	Vinyl Composition Tile
VERT	vertical
VG	vertical grain
VIF	verify in field
VWC	vinyl wall covering
W	width, wide, water
W/	with
W/O	without
WC	water closet
WD	wood, wood finish
WP	waterproof(ing)
WNS	wainscot
WR	water resistant
WS	waterstop
WW	window wall
WWC	wood wall covering
WWF	woven wire fabric

B. Words which may be found elsewhere in the Project Manual and Drawings are abbreviated in accordance with the standards set forth in the following table:

&	and
λ	angle
@	at
ι	diameter, round
"	inches
:	is, shall b
'	feet
ζ	perpendicular
/	per
%	percent
#	pound, number
X	by (as in 2 by 4)

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 42 16 - DEFINITIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Words which may be found elsewhere in the Contract Documents are defined in accordance with the standards set forth in the following table:

Approve:

Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be limited to the Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contract requirements.

As Detailed, As Shown:

Where “as detailed”, “as shown” or words of similar importance are used, it shall be understood that reference to the Drawings accompanying the Specifications is made unless otherwise stated.

As Directed, As Required, As Authorized, As Reviewed, As Accepted:

Where “as directed”, “as required”, “as authorized”, “as reviewed”, “as accepted” or words of similar importance are used, it shall be understood that the direction, requirement, permission, authorization, review, or acceptance of the Architect is intended, unless otherwise stated.

As Indicated:

Where “as indicated” is used it shall be understood that reference to Drawings and/or Specifications is made unless otherwise stated.

Directed, Requested, etc.:

Terms such as "directed," "requested," "authorized," "selected," will be understood as "directed by Architect," "requested by Architect," and similar phrases shall not be interpreted to extend Architect's responsibility into Contractor's responsibility for construction supervision.

Furnish:

Except as otherwise defined in greater detail the term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

Indicated:

The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specifications and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference and no limitation of location is intended except as specifically noted.

Install:

Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

Installer:

The term "installer" is defined as the entity (person or firm) engaged by Contractor, or its subcontractor or subsubcontractor for performance of a particular unit of Work at project site,

including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

Provide:

Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 42 19 - REFERENCE STANDARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality Assurance.

B. Location of References.

C. Schedule of References.

1.2 QUALITY ASSURANCE

A. For products or quality of work specified by association, trade, or federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents.

C. General Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable standards of the construction industry have the same force and effect as if bound or copied directly into Contract Documents.

D. Such standards are made a part of the Contract Documents by reference.

E. Individual sections indicate which codes and standards the Contractor must keep at the project site, available for reference.

F. Referenced industry standards take precedence over standards which are not referenced but recognized in industry as applicable.

G. Non-referenced standards are not directly applicable to the Work, except as a general requirement of whether the Work complies with standards recognized in the construction industry.

1.3 LOCATION OF REFERENCES

A. Valley Library, Oregon State University.

1.4 SCHEDULE OF REFERENCED ASSOCIATIONS

AIA	American Institute of Architects www.aia.org
AISC	American Institute of Steel Construction www.aisc.org
AISI	American Iron and Steel Institute www.steel.org
ANSI	American National Standards Institute www.ansi.org
APA	American Plywood Association www.apawood.org
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers www.ashrae.org

ASTM	American Society for Testing and Materials www.astm.org
AWPA	American Wood Protection Association www.awpa.com
AWS	American Welding Society www.aws.org
BIA	Masonry Institute of America www.masonryinstitute.org
BOLI	Oregon Bureau of Labor and Industries www.boli.state.or.us
CCB	Construction Contractors Board www.oregon.gov.ccb/
CDA	Copper Development Association www.copper.org
CISPI	Cast Iron Soil Pipe Institute www.cispi.org
CSI	Construction Specification Institute www.csinet.org
DEQ	Department of Environmental Quality (Oregon) www.oregon.gov/deq/
DHI	Door and Hardware Institute www.dhi.org
DOT	Department of Transportation www.dot.gov
EPA	U.S. Environmental Protection Agency www.epa.gov
FM	Factory Mutual System www.fmglobal.com
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) www.gsa.gov/portal/content/103856
IBC	International Building Code www.iccsafe.org
ICBO	International Conference of Building Officials publicecodes.citation.com/icod/ibg/index.htm
IRS	Internal Revenue Service www.irs.gov

ISA	Instrumentation Systems and Automation Society www.isa.org
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org
NBFU	National Board of Fire Underwriters www.nfpa.org
NEC	National Electric Code www.necplus.org
NEMA	National Electrical Manufacturers' Association www.nema.org
NESC	National Electrical Safety Code www.ieee.org
NFPA	National Fire Protection Association www.nfpa.org
NRCA	National Roofing Contractors' Association www.nrca.net
OAR	Oregon Administrative Rules arcweb.sos.state.or.us/404.html
OESP	State of Oregon Electrical Specialty Code http://www.bcd.oregon.gov/programs/online_codes.html
ORS	Oregon Revised Statutes landru.leg.state.or.us/ors/
OSHA	Occupational Safety and Health Administration www.osha.gov
OSSC	Oregon Structural Specialty Code http://www.bcd.oregon.gov/programs/online_codes.html
PS	Product Standard standards.gov/standards.cfm
SDI	Steel Door Institute www.steeldoor.org
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org
SPRI	Single Ply Roofing Institute www.spri.org
SSPC	Steel Structures Painting Council www.sspc.org
SWRI	Sealing, Waterproofing and Restoration Institute www.swironline.org

UBC	Uniform Building Code (See ICBO)
UFC	Uniform Fire Code www.nfpa.org
UL	Underwriters' Laboratories, Inc. www.ul.com
UMC	Uniform Mechanical Code www.ubc.com
UPC	Uniform Plumbing Code www.ubc.com
WHL	Warnock Hersey Laboratories www.intek.com/marks/wh/
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org
WWPA	Western Wood Products Association www.wwpa.org

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 45 00 - QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Codes, regulations and permits.

B. Procedures for quality control.

1.2 OWNER RESPONSIBILITIES

A. Owner will employ and pay for services of an independent testing laboratory to perform inspection, sampling and testing as required by local building authority.

B. Owner's Authorized Representative will provide on-site observation during construction.

1.3 CODES, REGULATIONS AND PERMITS

A. All Work shall conform with the Oregon Structural Specialty Code (OSSC) based on the International Building Code (IBC), as amended by the State of Oregon Building Codes Division and the edition designated by the governing authority.

B. Contractor shall comply with all applicable state and local construction codes.

C. References to codes, Specifications and standards referred to in the Contract Documents shall mean, and are intended to be, the latest edition, amendment or revision of such reference standard in effect as of the date of these Contract Documents.

D. The Owner shall be responsible for all permits and City of Corvallis plan review fees; the Contractor shall be responsible for all licenses and associated fees required for the Project.

1. Contractor shall be responsible for obtaining all additional miscellaneous permits other than the overall building permit, including permits for delegated design work. Coordinate with Section 01 61 16 "Delegated Design Requirements".

E. Contractor shall arrange and attend all required permit inspections and furnish evidence of approved City inspection reports per Section 01 77 00.

1.4 QUALITY OF WORK

A. It is the true and specific intent of these Specifications that quality of Work on all phases of the construction and embracing all the trade sections shall be of high quality performed by workers skilled in their trade and performing their Work only according to the standard of best practice of the trade.

B. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with manufacturer's directions unless otherwise specified.

C. If Work is required in a manner to make it impossible to produce first quality Work, or should discrepancies appear among Contract Documents, request interpretation from Architect before proceeding with Work.

D. Failure to secure interpretation may cause rejection by Architect or owner of installation.

1.5 LAYOUT

A. Be responsible for properly laying out the Work and for lines and measurements for the Work.

B. Verify the figures shown on the drawings before laying out the Work and report errors or inaccuracies to the Architect before commencing Work.

C. Strict compliance with maximum slopes is required. Accessible parking spaces and adjacent access aisles with slope exceeding 2% in any direction, as determined by OSU, shall be removed and replaced by the contractor at their expense.

D. Strict compliance with maximum slopes is required. New sidewalks exceeding 1:20 slope or with cross slope exceeding 2%, as determined by OSU, shall be removed and replaced by the contractor at their expense. Ramps exceeding 1:16 slope or with cross slope exceeding 2%, as determined by OSU, shall be removed and replaced by the contractor at their expense.

1.6 SUPERVISION

A. The Contractor shall maintain effective supervision on the project at all times Work is being performed.

B. The superintendent shall be the same person throughout the project and shall attend the preconstruction conference.

1.7 INSPECTIONS AND TESTING

A. Contractor shall notify the Owner at least twenty-four (24) hours in advance of any required progress inspection or final inspection including final punch list inspection.

B. Cooperate with laboratory personnel, provide access to Work and furnish incidental equipment material and labor required for field testing and sample taking.

1.8 EVALUATION OF TESTS AND INSPECTIONS

A. Results of laboratory and/or field control tests and inspections shall be the principal basis upon which satisfactory completion of Work shall be judged.

B. If results of tests and inspections indicate Work is below requirements of Contract Documents, that portion of Work is subject to rejection.

1.9 ADJUSTMENTS

A. Remove and replace Work so rejected at Contractor’s expense including costs of subsequent tests and inspections until Work meets requirements of Contract Documents.

B. The Owner reserves the right to perform any testing as may be required to determine compliance with the Contract Documents.

C. Costs for such testing will be the Owner’s responsibility unless testing indicates noncompliance. Cost for such testing indicating noncompliance shall be borne by the Contractor.

D. Noncomplying Work shall be corrected, and testing will be repeated until the Work complies with the Contract Documents.

E. Contractor will pay costs for retesting noncomplying Work.

1.10 COORDINATION DRAWINGS

A. Contractor and sub-contractors shall prepare and provide coordinated shop drawings showing the routing and interaction of the following items:

1. Structural framing.
2. Sprinkler piping.
3. Plumbing piping.
4. Mechanical piping, ductwork and equipment.
5. Electrical conduit larger than 2 inches.
6. Data/ Telecom cable tray and conduit larger than 2 inches.

B. Show items overlaid together and in separate colors. Label each item with their mounting heights and identify conflicts during creation of coordination drawings.

C. Review with Owner and Architect prior to installation. Provide the Coordination Drawings in Portable Document Format (PDF) to Owner and Architect.

1.11 MOCKUPS

A. Interior Casework Mockup: Provide a full scale Casework Mockup of one complete locker that demonstrates the finished cabinet construction, including:

1. Entire casework carcass, bottom, middle and top
2. Doors, drawers and associated hardware
3. Finish surface recesses
4. Interior hardware, all hooks, clothing rod and mirror
5. Power and data application

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 51 00.01 - OREGON STATE UNIVERSITY CONSTRUCTION AND MAINTENANCE SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 CONTACT

A. EH&S, 130 Oak Creek Building, Corvallis, OR 97331-7405, (541) 737-2505.

B. FAX (541) 737-9090

1.2 COMPLETE OSU CONSTRUCTION AND MAINTENANCE SAFETY FORM

A. Send completed documents (including Site Safety Plan and all separate answer pages) to Construction Contract Administration along with the signed contract and bonds.

1.3 PROJECT ISOLATION

A. All construction and remodeling activities regardless of size and/or scope must be fenced, barricaded, or otherwise protected to restrict entrance and to ensure the safety of those in the general area. See isolation requirements.

1.4 SITE SAFETY PLAN

A. A site safety plan will be required and will address:

1. General Information
2. Emergency Information
3. Key Organization Personnel
4. Hazard Evaluation/Facility Impact
5. Emergency Procedures
6. Work Zones
7. Security Measures
8. Fire Protection

B. A model plan is attached. This form can be used if another plan has not already been prepared. Contact OSU Environmental Health & Safety for more information 737-2505.

1.5 ISOLATION REQUIREMENTS

A. General: All construction, maintenance, and remodeling activities, regardless of size or scope, must be fenced, barricaded, or otherwise isolated to restrict entrance and to ensure the safety of those in the general area.

B. Outdoor Activities: Outdoor projects require the following perimeter isolation:

1. A six foot chain-link fence, with controlled access points, extending in all directions around the excavation or building site such that no area of the construction is accessible to pedestrians or unauthorized personnel or vehicles.
2. Isolation area will include vehicle loading and unloading areas.
3. At the University’s option, other barricading plans may be accepted. These may apply to projects such as road resurfacing, parking lot striping, exterior building water proofing, deliveries, etc. Contact EH&S regarding other barricading plans.

C. Overnight: Any excavation across or adjacent to sidewalks or pathways which must be left open overnight, must be identified with working, blinking construction lights in addition to solid barricades

1. Indoor Activities: Indoor construction or maintenance projects which will create dust, potentially hazardous fumes or vapors, or offensive odors are subject to the following isolation:

2. Areas where existing doors can provide isolation will be labeled "Construction Area--Authorized Personnel Only ".

3. All other areas will be isolated by a solid barrier. The minimum barrier allowed is 4 mil poly sheeting sealed to prevent migration of dust.

4. Mechanical ventilation may be required.

5. A solid wall is required if building envelope is opened to the outside.

D. Contractor Responsibilities

1. The contractor will provide all barricading, isolation, and fencing material. OSU will not provide any materials.

2. The contractor will also provide all appropriate warning and detour signs when sidewalks, exits, or roads are closed.

3. Contractor will provide all other construction area signs.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 51 00.02 - OSU CONSTRUCTION AND MAINTENANCE SAFETY FORM

Send completed safety documents to Construction Contract Administration with contract and bonds.

Date: _____ Project: _____

Start Date: _____ Completion date: _____

Contractor:_____ Contact: _____

Work # _____ 24hr #: _____

OSU Project Mgr.: _____ Work/24hr #'s: _____

Dept Contact: _____ OSU EH&S Contact: _____

Preconstruction meeting? **Y N** Date/Time/Location: _____

For the following items, prepare answers on a separate sheet for all items marked "Yes". Precede each answer with the appropriate item number. All boxes need to be checked

Y	N		For This Project	If YES, then:
		1	Will any confined spaces be accessed?	Describe location of entry Specify location of permit Notify EH&S prior to entry See SAF 209
		2	Will hot work be performed (welding, cutting, brazing, etc.)?	Provide min. 5# 2A10BC extinguisher within 10 ft If indoors - provide and describe ventilation See SAF 214
		3	Any products brought to campus?	Provide MSDS on site prior to first use; Make available to OSU on request
		4	Will lead paint be impacted?	Describe plan to limit contamination
		5	Will asbestos-containing-material be impacted?	Coordinate with OSU asbestos manager
		6	Will <u>any</u> materials (construction debris, soil, water, etc) be removed from campus?	Describe in detail identity and disposition of material (how, where)
		7	Any open trenches or holes?	Describe isolation procedures (see Page 1)
		8	Will a crane be used?	Describe crane safety plan (include plan to prevent loads above occupied areas)
		9	Is this project building a new facility, a major remodel?	Provide Site Safety plan Describe isolation procedures (see Page 1)
		10	Is this a minor remodeling project?	Provide, or fill out model Site Safety Plan form (see Page 3) Describe isolation procedures (see Page 1)
		11	Will air contamination be produced (e.g. dust, CO, solvent vapors, VOCs, odors)?	Describe project ventilation and isolation Indicate position of building air intake(s)
		12	Will there be noise > 85 dB?	Describe noise minimization plan
		13	Will this project use a scaffold or an external chute?	Describe isolation, dust control, installation
		14	Will this project involve a working surface >6' above a lower level	Describe fall protection
		15	Will any "blind" saw-cuts or penetrations be made in existing foundations, floors, ceilings and/or walls?	Describe plan for detecting and protecting power lines or other building utility lines.

EH&S Review: _____ Date: _____

END OF SECTION

SECTION 01 51 00.03 - MODEL SITE SAFETY PLAN

1. General Information

Contractor name_____
Address_____
City, State, Zip_____
Site Safety Officer_____ Project Dates_____
Project Name_____

2. Emergency Information

Emergency Response	911	OSU EH&S and OSU Facilities Services must be notified in the event of an emergency
Hazardous Materials Spill		
MSDS on-site location		
OSU EH&S	(541) 737-2505	
Facilities Services	(541) 737-2969	

3. Contractor Key Personnel

	Name	Phone	Emergency Contact
Company Owner			
Project Manager			
Job Supervisor			
Site Safety Officer			
Other Responsible Individual			
24 Hour Notification			

List of employees on site _____

4. Hazard Evaluation/ Facility Impact

Physical	Yes / No
Heavy Equipment	
Noise	
Heat	
Elevation	
Radiation Materials	
Excavations	
Underground Utilities	
Confined Spaces	
Fire Prevention	
Electrical	

5. Emergencies

Services
Evacuation Route
First Aid Location
Hazardous Materials Spill Procedure

6. Work Zones

Material Storage_____
Parking locations_____
Individuals with OSU keys_____
Access issues_____

7. Security measures_____

8. Fire protection _____

END OF SECTION

SECTION 01 57 22 - CONSTRUCTION INDOOR AIR QUALITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section describes Construction Indoor Air Quality (IAQ) goals and includes administrative and procedural requirements for the development and execution of a construction air quality management plan.

B. Related Sections include the following:

1. Section 01 60 00 “Product Requirements” procedures for storage of interior materials to prevent exposure to moisture and pollutants.

2. Division 23 “HVAC” Section “Basic Mechanical Materials and Methods” for duct cleaning procedures.

1.3 INDOOR AIR QUALITY MANAGEMENT

A. The Owner has established that the contractor shall prevent indoor air quality problems resulting from the construction process, to sustain long term installer and occupant health and comfort.

B. Protect the ventilation system components during construction and clean contaminated components after construction is complete.

C. Control sources of potential IAQ pollutants by controlling selection of materials and processes used in project construction.

1.4 SUBMITTALS

A. IAQ Management Plan for the construction and pre-occupancy phases of the project.

B. Photographs documenting construction IAQ management measures implemented during construction such as duct protection measures and measures to protect on-site stored or installed absorptive materials from moisture.

C. Cut sheets of filtration media used during construction with MERV values highlighted.

1.5 CONSTRUCTION AIR QUALITY MANAGEMENT PLAN

A. Develop a Draft Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

1. During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).

2. Protect stored on-site or installed absorptive materials from moisture damage.

B. The SMACNA IAQ Guidelines for Occupied Buildings under Construction provides an overview of air pollution associated with construction, control measures, construction process management, quality control, communicating with occupants, and case studies. These guidelines can be accessed at www.smacna.org. Chapter 3 of the SMACNA Guidelines recommends Control Measures in five areas: HVAC protection, source control, pathway interruption,

housekeeping, and scheduling. Review the applicability of each Control Measure and include those that apply in the Draft IAQ Management Plan.

1. HVAC Protection: Shut down the return side of the HVAC system whenever possible during heavy construction. If the system must remain operational during construction include the following strategies that apply:
    a. Fit the return side of the HVAC system with temporary filters with a Minimum Efficiency Reporting Value (MERV) of 8.
    b. Isolate the return side of the HVAC system from the surrounding environment as much as possible (e.g., place all tiles for the ceiling plenum, repair all ducts and air handler leaks).
    c. Damper off the return system in the heaviest work areas and seal the return system openings with plastic.
    d. Upgrade the filter efficiency where major loading is expected to affect operating HVAC system.
    e. Clean permanent return air ductwork per National Air Duct Cleaning Association standards upon completion of all construction and finish installation work.
    f. Replace all filtration media prior to occupancy.
3. Source Control: Propose the substitution of non-toxic formulations of materials that are generally the responsibility of the contractor such as caulks, sealants, and cleaning products.
4. Pathway Interruption: Prevent contamination of clean spaces. Include the following strategies that apply:
    a. Use 100% outside air ventilation (when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30% and 60%) with air exhausted directly to the outside during installation of finishes and other VOC emitting materials.
    b. Erect some type of barrier between work areas or between the inside and outside of the building to prevent unwanted airflow from dirty to clean areas.
5. Housekeeping: Reduce construction contamination in the building prior to occupancy through HVAC and regular space cleaning activities.
    a. Store building materials in a weather tight, clean area prior to unpacking for installation.
    b. Check for possible damage to building materials from high humidity.
    c. Clean all coils, air filters, and fans before testing and balancing procedures are performed.
6. Scheduling: Specify construction sequencing to reduce absorption of VOC's by materials that act as sinks or contaminant sources. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing sink materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings are installed.
    d. Protect stored on-site or installed absorptive materials from exposure to moisture through precipitation, plumbing leaks, or condensation from the HVAC system to prevent microbial contamination.

C. Draft IAQ Management Plan Review Meeting: Once the Owner and Architect have reviewed the Draft IAQ Management Plan and prior to construction at the site, schedule and conduct a meeting to review the Draft IAQ Management Plan and discuss procedures, schedules and specific

requirements for IAQ during the construction and pre-construction phases of the building. Discuss coordination and interface between the Contractor and other construction activities. Identify and resolve problems with compliance to the requirements. Record minutes of the meeting, identify all conclusions reached and matters requiring further resolution.

1. Attendees: The Contractor and related Contractor personnel associated with the work of this section, including personnel to be in charge of the IAQ management program, Architect, Owner and such additional personnel as the Architect or Owner deem appropriate.

D. Final IAQ Management Plan: Make any revisions to the Draft IAQ Management Plan agreed upon during the meeting identified in item (C) above and incorporate resolutions agreed to be made subsequent to the meeting. Submit the revised plan to the Owner and Architect for approval within 10 calendar days of the meeting.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

3.1 IMPLEMENTATION OF IAQ MANAGEMENT PLAN

A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing and the IAQ Management Plan for the Project.

B. Progress Meetings: Construction related IAQ procedures shall be included in the pre-construction and construction progress meeting agendas.

C. Distribution: The Contractor shall distribute copies of the IAQ Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Architect.

D. Instruction: The Contractor shall provide on-site instruction of the IAQ procedures and ensure that all participants in the construction process understand the importance of the goals of the IAQ Management Plan.

END OF SECTION

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Summary:

1. Product options.
2. Owner-furnished products.
3. Product delivery, storage and handling.

1.2 PRODUCTS

A. Products:

1. New material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.
2. Products may also include existing materials or components specifically identified for reuse.

B. Use interchangeable components of the same manufacture for similar components.

C. Unless otherwise specified, all material and equipment shall be new; free from defects impairing strength, durability, and appearance; of current manufacture.

D. Items specified shall be considered minimum as to quality, function, capacity, and suitability for application intended.

E. Items incorporated into the Work shall conform to applicable specifications and standards designated, and shall be of size, make, type, and quality specified.

F. Design, fabricate, and assemble in accordance with current best engineering, industry, and shop practices.

G. Manufacture like parts of duplicate units to standard size and gauge to make them interchangeable.

H. Two or more items of the same kind shall be identical and made by the same manufacturer.

1.3 PRODUCT OPTIONS

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

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

C. Products Specified by Naming One [or More] Manufacturer[s]: Products of manufacturer[s] named and meeting specifications, no options or substitutions allowed.

D. Substitution Procedure: Under Section 01 25 00.

1.4 REUSE OF EXISTING PRODUCTS

A. Except as specifically indicated or specified, materials and equipment removed from existing construction shall not be used in the completed Work.

B. For material and equipment specifically indicated or specified to be reused in the Work:

1. Use care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.

2. Arrange for transportation, storage, and handling of products which require off-site storage, restoration, or renovation.

3. Remove and reinstall mechanical units, vents, guys, antennae, and electrical and grounding wires or conduits.

1.5 OWNER FURNISHED PRODUCTS

A. Designate delivery dates of Owner-furnished items in the construction schedule.

B. Receive, unload, store and handle Owner-furnished items at the site; protect from damage.

1.6 DELIVERY, STORAGE AND HANDLING

A. Transport, handle, store and protect products in accordance with manufacturer's instructions.

B. Arrange deliveries in accordance with construction schedules; coordinate to avoid conflict with Work and site conditions.

C. Deliver and store products in undamaged condition in manufacturer's original containers or packaging with identifying labels intact and legible.

D. Inspect shipments to assure compliance with Contract Documents and reviewed submittals, and that products are undamaged.

E. Prevent soiling or damage to products or packaging.

F. Interior Storage: Maintain required temperature and humidity ranges. Verify that Owner furnished storage meets product manufacturer's requirements.

G. Exterior Storage:

1. Store materials above ground to prevent soiling and/or moisture infiltration.

2. Cover materials with waterproof breathable sheet coverings; provide adequate ventilation.

3. All storage locations to be approved in advance by the Owner.

H. Arrange storage to provide access for inspection.

I. Coordinate with Owner’s Authorized Representative all on-site storage activities.

J. Provide for security of stored products.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 61 16 - DELEGATED DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. General: This Section specifies administrative and procedural requirements for delegated design indicated in the various Sections of these Specifications.

B. Section Includes: Structural and other design requirements for delegated design components, otherwise known as fabricator-designed, bidder-designed or bidder design-build components.

C. This Section applies to Technical Specification Sections, and supplements requirements indicated in the General and Supplementary Conditions.

D. Delegated design does not mean deferred submittal. Refer to Drawings for deferred submittals.

E. Related Requirements: Refer to Sections indicated for specific delegated design requirements, including, but not limited to the following:

1. Section 05 50 00 “Metal Fabrications” for miscellaneous supports and framing.
2. Section 09 22 16 “Non-Structural Metal Framing”.
3. Section 09 51 13 “Acoustical Panel Ceilings” for system design with deferred permit submittal.
4. Division 21 “Fire Suppression” Sections for delegated design fire suppression with deferred permit submittal.
5. Division 22 Sections “Hangers, Supports, and Anchors for Plumbing” and “Vibration and Seismic Controls for Plumbing Piping and Equipment” for delegated design Seismic bracing for Plumbing equipment with deferred permit submittal.
6. Division 23 Sections “Hangers, Supports, and Anchors for HVAC” and “Vibration and Seismic Controls for HVAC Piping and Equipment” for delegated design Seismic bracing for MEP equipment with deferred permit submittal.
7. Division 28 “Electrical Safety and Security” Sections for delegated design fire alarm system with deferred permit submittal.
8. Sections 31 05 10 “Design-Build Shoring” and 31 20 00 “Earth Moving” for delegated design of Shoring system.

1.2 DEFINITIONS

A. Contractor Design Requirements: Where occurs, same meaning as Delegated Design Requirements.

B. Delegated Design Work: Design services and certifications provided by a Professional Engineer registered as such in the State where the Project is located related to systems, materials or equipment required for the Work to satisfy design and performance criteria established by the Contract Documents. Delegated Design does not include professional services the Contractor needs to fulfill their responsibilities under the Contract including but not limited to construction means, methods and sequence.

C. Seal: Certification that builder design plans, computations and specifications were designed and prepared under the direct supervision of the Architect or Engineer whose name appears thereon.

D. Approval Stamp: Certification obtained by the Contractor that the Building Official has reviewed a submittal and finds it acceptable with respect to applicable regulatory requirements.

E. Bidder-Design: Design services provided by an installer or manufacturer complying with quality assurance, performance requirements and design requirements indicated and established by the Contract Documents. Bidder-design does not include Professional Engineering unless indicated otherwise.

1.3 DELEGATED- AND BIDDER-DESIGN SERVICES

A. Where referenced in these specifications, Delegated Design components and their attachments to the structure shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters as specified in this individual sections.

B. Where referenced in these specifications, Bidder-Design components and installation shall comply with the currently adopted edition of all applicable state and local ordinates, with parameters specified in this and individual sections.

C. Permitting Agency Requirements: Follow the requirements for permits current at the time of submission. The General Contractor is responsible to coordinate and submit all material required, so the permitting agency's review will not adversely affect the construction schedule. At or near time of application, the General Contractor shall meet with the permitting agency to identify Delegated Design components and how they are to be submitted and processed for permits.

D. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.4 SUBMITTALS

A. General: Submit complete Delegated Design Submittals to meet permitting agency requirements for permits. Include drawings and calculations for that portion of the Work signed and sealed by a State of Oregon registered engineer. Incomplete submittals or submittals not previously reviewed and so stamped by General Contractor will not be accepted for review by the Architect or Engineer of Record.

B. These submittal requirements are in addition to other submittal requirements stated elsewhere in the contract documents.

1.5 QUALITY ASSURANCE

A. Where referenced in these specifications, Delegated Design components and their attachments to the structure shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters as specified in this section.

B. Permitting Agency Requirements: Follow the requirements for permits current at the time of submission. The General Contractor is responsible to coordinate and submit all material required, so the permitting agency's review will not adversely affect the construction schedule. At or near time of application, the General Contractor shall meet with the permitting agency to identify Delegated Design components and how they are to be submitted and processed for permits.

1.6 INSURANCES

A. Refer to General Conditions for Insurance and Bonds.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

3.1 WORK INCLUDED

A. General: Certain of the components of the Work under this project are Delegated Design. It is the General Contractor's responsibility to coordinate and assume or assign to subcontractors the complete responsibility for the design, calculations, submittals, fabrication, transportation and installation of the Delegated Design portions or components as required in this Section.

B. The General Contractor is responsible to submit all documents required by the permitting agency for the separate approval and permit for each Delegated Design item. Delegated Design components of this Work are defined as complete, operational systems, provided for their intended use.

C. All permit plan review and permit fees for Delegated Design items are the responsibility of the submitting General Contractor.

3.2 DOCUMENTS REQUIRED

A. General: Delegated Design documents and related permits issuance must be completed prior to fabrication. The General Contractor must complete and submit a Contractor Design Summary Sheet listing Delegated Design Subcontractors and their registered engineer's names and phone numbers prior to submission of the Delegated Design documents for review.

B. Scope of Documents: Delegated Design components are shown in the Contract Documents for design intent. The purpose is to have the General Contractor responsible to provide, coordinate and install each Delegated Design component.

1. Delegated Design components attached to the structural frame or supplemental to the structural frame shall be designed for the anticipated loads as outlined in the Contract Documents. These Delegated Design components are all to be coordinated with appropriate subcontractors.

2. Load reactions at the interface between the Delegated Design components and the structural frame shall be clearly defined to allow for a review by the Architect and Engineer of Record.

C. Component Certification: Certify that mechanical and electrical components comply with the structural provisions of all applicable codes.

1. Shop Drawings: Submit shop drawings for all attachments to the structure for all elements requiring structural design per these specifications. These attachments include, but are not limited to, structural bracing for equipment, conveyances, and architectural components; seismic restraints of vibration isolation systems; and details of lateral bracing and attachment systems designed to accommodate differential movement between building levels.

2. Shop Drawings shall be sealed by the structural engineer responsible for their design.

D. Quality Assurance Plan: Submit a quality assurance plan for the designated structural system of all elements requiring structural design per these specifications. Quality assurance plan shall comply with Owner's requirements and all applicable codes.

END OF SECTION

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

A. Section 01 25 00, Product Substitution Procedures.

B. Section 01 33 23, Shop Drawings, Product Data, Samples

1.3 SUBMITTALS

A. Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of the Work.
2. Efficiency, maintenance, or safety of any operational element.
3. Visual qualities of sight exposed elements.
4. Work of Owner or separate contractor.

B. Include in request:

1. Identification of project.
2. Location and description of affected work.
3. Necessity for cutting or alteration.
4. Description of proposed work, and products to be used.
5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate contractor.
7. Written permission of affected separate contractor.
8. Date and time work will be executed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Primary Products: Those required for original installation.

B. Product Substitution: For any proposed change in materials, submit request for substitution under provisions of Section 01 25 00.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work.

B. Provide devices and methods to protect other portions of the Work from damage.

C. Provide protection from elements for areas which may be exposed by uncovering work.

3.3 CUTTING AND PATCHING

A. Execute cutting, fitting and patching to complete work.

B. Fit products together, to integrate with other work.

C. Remove and replace defective or non-conforming work.

D. Provide openings in the work for penetration of mechanical and electrical work.

3.4 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 not allowed without prior approval from Owner's Authorized Representative.

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

D. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with approved fire rated material, to full thickness of the penetrated element.

E. Refinishing:

1. Refinish surfaces to match adjacent finish.

2. For continuous surfaces, refinish to nearest intersection or natural break.

3. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01 74 00 - CLEANING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Related requirements specified elsewhere, cleaning for specific products or work: Specification section for that work.

B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.

C. At completion of Work remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.2 QUALITY ASSURANCE

A. Standards: Maintain project in accord with applicable safety and insurance standards.

B. Hazard Control:

1. Store volatile wastes in covered metal containers.

2. Provide adequate ventilation during use of volatile or noxious substances.

1.3 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

A. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

1.4 DURING CONSTRUCTION:

A. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

B. At reasonable intervals during progress of Work clean site and public properties, and dispose of waste materials, debris and rubbish.

C. Provide on-site containers for collection of waste materials, debris and rubbish.

D. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.

E. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until project is ready for Substantial Completion or occupancy.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

1.5 FINAL CLEANING

A. Employ experienced workers, or professional cleaners, for final cleaning.

B. In preparation for Substantial Completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove grease, dust, dirt, stains, labels, and other foreign materials from exposed interior and exterior finished surfaces.

D. Remove putty, paint, labels, lubricants, etc., from windows, mirrors, and sash, and then polish, taking care not to scratch glass.

E. Vacuum carpeting (shampoo where required), removing debris and excess nap.

F. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

G. Replace air filters where units were operated during construction.

H. Maintain cleaning until project, or portion thereof, is occupied by Owner.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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 waste management and disposal.

1.3 WASTE MANAGEMENT REQUIREMENTS

A. Provide for waste management in conformance with City of Corvallis policy.

B. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

C. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:

1. Aluminum and plastic beverage containers.
2. Corrugated cardboard.
3. Wood pallets.
4. Clean dimensional wood.
5. Land clearing debris, including brush, branches, logs, and stumps.
6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
7. Glass.
8. Gypsum drywall and plaster.
9. Plastic buckets.
10. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
11. Paint.
12. Concrete.
13. Bricks.
14. Concrete Masonry Units (CMU).
15. Asphalt.

E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

G. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.

H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.4 RELATED SECTIONS

A. Section 01 51 00 “Construction Facilities and Temporary Controls” for additional requirements related to trash/waste collection and removal facilities and services.

B. Section 01 60 00 “Product Requirements” for waste prevention requirements related to delivery, storage, and handling.

1.5 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Material Stream: A material flow coming from a jobsite into markets for building materials including a specific material category that is diverted in a specific way or a mixture of several material categories that are diverted in a specific way.

E. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

F. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

H. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

I. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

J. Return: To give back reusable items or unused products to vendors for credit.

K. Reuse: To reuse a construction waste material in some manner on the project site.

L. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

M. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

N. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

O. Toxic: Poisonous to humans either immediately or after a long period of exposure.

P. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

Q. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.6 SUBMITTALS

A. Waste Management Plan: Include the following information:

1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.

2. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.

3. Communication: Identify recycling manager for the project. Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal. Describe provided references, signage and other measures to be used onsite to help subcontractors, vendors and field personnel comply with waste diversion goals efficiently.

4. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.

5. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

6. Goals: Clearly delineate goals of the Waste Management Plan including at least seventy five percent landfill diversion of construction waste generated by the Work with a minimum of four separate diverted material streams. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.

2. Submit Report on a form acceptable to Owner.

3. Landfill Disposal: Include the following information:

a. Identification of material type.

b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.

c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

4. Incinerator Disposal: Include the following information:

a. Identification of material type.

b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.

c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

5. Recycled and Salvaged Materials: Include the following information for each:

a. Identification of material, including those retrieved by installer for use on other projects.

b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.

c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:

a. Identification of material and how it was used in the project.

b. Amount, in tons or cubic yards.

c. Include weight tickets as evidence of quantity.

7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

3.1 GENERAL

A. Recycle and/ or salvage non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be divided from disposal and whether the materials will be sorted on-site or comingled.

3.2 WASTE MANAGEMENT PROCEDURES

A. Refer to Section 01 51 00 “Construction Facilities and Temporary Controls” for additional requirements related to trash/waste collection and removal facilities and services.

B. Refer to Section 01 60 00 “Product Requirements” for waste prevention requirements related to delivery, storage, and handling.

3.3 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Pre-bid meeting.

2. Pre-construction meeting.

3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. Provide containers as required.

2. Provide adequate space for pick-up and delivery and convenience to subcontractors.

3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 77 00 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The requirements specified in this section relate to all Contractors individually performing under these Contract Documents:

1. Project Record Documents.
2. Final review and payment.

B. Related work specified elsewhere:

1. OSU General Conditions.
2. Shop Drawings, Product Data and Samples, Section 01 33 23.

1.2 PROJECT RECORD DOCUMENTS

A. The Project Record Documents (“As-Builts”) shall be prepared by the General Contractor (GC).

B. The Project Record Documents shall be organized to include the following information:

1. Table of Contents
2. Project Team List
3. Specifications (Including Addenda and Change Orders)
4. Drawings
5. Inspection Reports, as applicable
6. Original Signed Warranty(ies)
7. Maintenance Instructions

C. Draft Project Record Documents shall be submitted for review upon 75% completion of the Work.

D. Project Record Documents shall be submitted electronically to the Owner. Hard copies will not be accepted.

E. The project team list shall include the name, address, and phone number of the Owner, Contractor, Inspector, Subcontractors, and the materials manufacturers.

F. Legibly mark each Specification section to indicate actual as-built condition indicating changes in the Work made by addenda or change order or actual materials used and actual manufacturer(s) used.

G. Maintain current and accurate as-built mark-ups during construction and make available to Owner’s Authorized Representative upon request.

H. Legibly mark the drawings to indicate actual as-built conditions indicating changes in the Work made by addenda or change order or actual conditions which differ from the drawings.

I. Redraw or provide new drawings as required for a complete as-built set of drawings. The Contractor shall maintain current and accurate as-built mark-ups during construction and make available to Owner’s Authorized Representative.

J. Include inspection reports if applicable.

K. Include, in a single section, all copies of the Project’s labor and material warranties clearly marked to identify the Owner's responsibilities under the terms of each warranty and the section of Work that each warranty covers. One set must be clearly marked as containing original documents.

L. In the case of an elevator installation, the Contractor's and manufacturer's warranty shall provide for the Owner's right to respond to emergency/car failure situations for the purpose of extricating individuals trapped in the elevator.

M. Include maintenance instructions complete with technical information and name, address, and phone number of the Contractor(s) and manufacturer(s) of each material and product.

1.3 FINAL REVIEW AND PAYMENT

A. Prior to completion, the Contractor shall inspect the Work and make a Punch-list noting all items that are incomplete and/or incorrect.

B. The Contractor shall notify all Subcontractors in writing of incomplete and/or incorrect items. Notify far enough in advance of the completion date that the Work can be completed on schedule. Said Work shall be immediately corrected.

C. Should conditions prevail which prohibit some elements of the Work from being accomplished, but the work-in-place will perform the primary function (i.e., painting cannot be completed due to high moisture content of masonry walls.) the Contractor shall record the reason with this Punch-list item requesting temporary delay in completion from the Owner in writing.

D. Notify the Owner in writing that all items are completed and ready for final review or else that the Work product is fully usable, but some listed deficiencies remain to be completed. Submit all record documents at this time.

E. The Owner will review all documents. When the documents include a Contractor's request for delay in completion, the Owner will review all Work which is certified as complete to the best knowledge of the Contractor. The Owner will also review the listed incomplete Work and assign a value to such uncompleted work.

F. The Contractor shall make the required corrections to the Work expeditiously. A letter will be addressed to the Contractor informing the Contractor of the project status.

G. When Contract closeout procedures are completed and all Punch-list deficiencies have been corrected, provide Owner with final corrected Project Record Documents based on Owner’s preliminary review. Correct Project Record Documents shall be in electronic format.

H. Final Completion by the Owner will be documented and the Contractor will receive written notice of acceptance of the Work and notification that final payment may be billed and released.

I. All warranties shall commence and become effective beginning on the date of Substantial Completion.

PART 2 - PRODUCTS

- Not Used -

PART 3 - EXECUTION

- Not Used -

END OF SECTION

SECTION 01 81 13 - SUSTAINABILITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general sustainability requirements.

1.3 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001. Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.

2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.

PART 2 - PRODUCTS

2.1 LOW-EMITTING MATERIALS

A. Adhesives and Sealants: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with VOC content limits of authorities having jurisdiction and with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.

2. Metal to Metal Adhesives: 30 g/L.

3. Adhesives for Porous Materials (Except Wood): 50 g/L.

4. Subfloor Adhesives: 50 g/L.

5. Plastic Foam Adhesives: 50 g/L.

6. Carpet Adhesives: 50 g/L.

7. Carpet Pad Adhesives: 50 g/L.

8. VCT and Asphalt Tile Adhesives: 50 g/L.

9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Contact Adhesive: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesive: 100 g/L.
18. Structural Wood Member Adhesive: 140 g/L.
19. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
20. Top and Trim Adhesive: 250 g/L.
21. Plastic Cement Welding Compounds: 350 g/L.
22. ABS Welding Compounds: 400 g/L.
23. CPVC Welding Compounds: 490 g/L.
24. PVC Welding Compounds: 510 g/L.
25. Adhesive Primer for Plastic: 650 g/L.
26. Sheet Applied Rubber Lining Adhesive: 850 g/L.
27. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
28. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
29. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
30. Other Adhesives: 250 g/L.
31. Architectural Sealants: 250 g/L.
32. Nonmembrane Roof Sealants: 300 g/L.
33. Single-Ply Roof Membrane Sealants: 450 g/L.
34. Other Sealants: 420 g/L.
35. Sealant Primers for Nonporous Substrates: 250 g/L.
36. Sealant Primers for Porous Substrates: 775 g/L.
37. Modified Bituminous Sealant Primers: 500 g/L.
38. Other Sealant Primers: 750 g/L.

B. Paints and Coatings: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:

1. Flat Paints, Coatings, and Primers: VOC not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC not more than 150 g/L.
3. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.

4. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
5. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
6. Floor Coatings: VOC not more than 100 g/L.
7. Shellacs, Clear: VOC not more than 730 g/L.
8. Shellacs, Pigmented: VOC not more than 550 g/L.
9. Stains: VOC not more than 250 g/L.
10. Flat Interior Topcoat Paints: VOC not more than 50 g/L.
11. Nonflat Interior Topcoat Paints: VOC not more than 150 g/L.
12. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
13. Clear Wood Finishes, Varnishes and Sanding Sealers: VOC not more than 350 g/L.
14. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
15. Floor Coatings: VOC not more than 100 g/L.
16. Shellacs, Clear: VOC not more than 730 g/L.
17. Shellacs, Pigmented: VOC not more than 550 g/L.
18. Stains: VOC not more than 250 g/L.
19. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
20. Dry-Fog Coatings: VOC not more than 400 g/L.
21. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
22. Pretreatment Wash Primers: VOC not more than 420 g/L.
23. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
24. Restricted Components: Paints and coatings shall not contain any of the following:
    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.
    j. 1,2-dichlorobenzene.
    k. Diethyl phthalate.
    l. Dimethyl phthalate.
    m. Ethylbenzene.
    n. Formaldehyde.

o. Hexavalent chromium.

p. Isophorone.

q. Lead.

r. Mercury.

s. Methyl ethyl ketone.

t. Methyl isobutyl ketone.

u. Methylene chloride.

v. Naphthalene.

w. Toluene (methylbenzene).

x. 1,1,1-trichloroethane.

y. Vinyl chloride.

C. Composite Wood: Composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products". Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin.

D. Flooring: Flooring shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Acoustic and Thermal Insulation: Ceilings, walls, and thermal insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 NONSMOKING BUILDING

A. Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Section 01 74 19 "Construction Waste Management and Disposal."

3.3 CONSTRUCTION IAQ MANAGEMENT

A. Comply with Section 01 57 22 “Construction Indoor Air Quality.”

B. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 01 51 00 "Construction Facilities and Temporary Controls," install MERV 8 filter media at each return-air inlet for the air-handling system used during construction.

2. Replace air filters immediately prior to occupancy.

3.4 IAQ ASSESSMENT

A. Flush-Out:

1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. (4 300 000 L) of outdoor air per sq. ft. (sq. m) of floor area while maintaining an internal temperature of at least 60 deg F (16 deg C) and a relative humidity no higher than 60 percent.

2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. (1 070 000 L) of outdoor air per sq. ft. (sq. m) of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. (1.52 L/s per sq. m) of outside air or the design minimum outside-air rate, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. (4 300 000 L/sq. m) of outside air has been delivered to the space.

B. Air-Quality Testing: Engage testing agency to perform the following:

1. Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air,".

2. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

a. Formaldehyde: 27 ppb.

b. Particulates (PM10): 50 micrograms/cu. m.

c. Ozone: 0.075 ppm, according to ASTM D5149.

d. Total Volatile Organic Compounds: 500 micrograms/cu. m.

e. 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.

f. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

g. Target Chemicals in California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Table 4-1 (except formaldehyde): Allowable concentrations in California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Table 4-1.

3. For each sampling point where the maximum concentration limits are exceeded, take corrective action until requirements have been met.

4. Air-sample testing shall be conducted as follows:

a. All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside-air flow rate for the occupied mode throughout the duration of the air testing.

b. Building shall have all interior finishes installed, including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings, such as workstations and partitions, are encouraged, but not required, to be in place for the testing.

c. Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 5000 sq. ft. (465 sq. m).

d. Air samples shall be collected between 3 and 6 feet (900 and 1800 mm) from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION

SECTION 02 41 19 - SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
2. Removal and reinstall of existing finish items that need to be removed in order to execute the work.
3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

A. General: Application: The following requirements apply to those items indicated in the Drawings.

B. Demolish: Same as “remove.”

C. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

D. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store for sale or reuse.

E. Remove and Save for Reuse: Same as “Remove and Salvage.”

F. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

G. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

H. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Unless otherwise indicated, salvaged and saved items are the property of Owner.

C. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished, removed and salvaged items.

a. Site-walk Review: Walk-through project with Architect to review all items for salvage and reuse.

b. Review whether additional survey of existing condition by structural engineer is required.

c. Review means and methods of demolition for items indicated to be salvaged or saved for reuse.

d. Review means and methods of demolition for items to be removed and adjacent to construction to remain visible.

2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

4. Review areas where existing construction is to remain and requires protection.

5. Document meeting with meeting minutes or other acceptable form, for review and distribution of all items to be salvaged and saved for reuse.

1.6 SUBMITTALS

A. Qualification Data: For refrigerant recovery technician, where in scope of Work.

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: After predemolition conference, indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted, where applicable.

a. Include list of items for salvage.

b. Indicate any special removal requirements or methods.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Use of stairs.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Owner’s requirements. Submit before Work begins.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a final list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Contractor will verify adequacy of structure and shoring.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.

2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is permitted where reviewed with Contractor, Owner and Architect for location and procedures prior to commencement of demolition Work.

1. Provide adequate storage areas for salvaged heavy timber and other wood items, including sufficient area required for sorting and grading activities.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

G. Shoring: Prior to commencement of demolition Work, verify all required shoring is in place for structural removal and modification.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

B. Coordinate storage layout areas with demolition and new construction schedules as to not interfere with Owner’s and Contractor’s operations.

C. Coordinate area required for heavy timber sorting and grading with wood grader.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

C. Recycle and/ or salvage non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be divided from disposal and whether the materials will be sorted on-site or comingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations may be done by weight or volume, but shall be consistent throughout. The minimum percentage of debris to be recycled or salvaged for each point threshold are 50 percent for 1 point and 75 percent for 2 points.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Review required scope of surveying in predemolition conference.

2. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3. Perform surveys where removal of structure has not been completed.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Where in scope of Work, before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Arrange to shut off utilities with utility companies.

2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

   b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

   c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

   d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

   e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

   f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

   g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

3. Cover and protect equipment that have not been removed.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Cut items complying with Section 01 73 29 “Cutting and Patching.”

5. Do not use methods for removing wood construction that damages surfaces or edges.
6. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
7. Maintain fire watch during and for at least four (4) hours after flame-cutting operations.
8. Maintain adequate ventilation when using cutting torches.
9. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
10. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
11. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items: Verify during preconstruction meeting.

1. Clean salvaged items.
    a. Clean items for sale and/or reuse to functional condition adequate for reuse.
2. Pack or crate items after cleaning. Identify contents of containers.
    a. Pack or crate items after cleaning and repair, and identify contents of containers for items for sale.
3. Store items in a secure area until delivery to Owner.
4. Metal components, and crane rail and equipment storage: Store in dry locations, off the ground.
5. Transport items to Owner's storage area designated by Owner.
6. Protect items from damage during transport and storage.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections, and one of the following:

1. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
2. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations.

3.9 SELECTIVE DEMOLITION SCHEDULE

A. All items listed below shall be reviewed, prior to commencement of demolition Work, during the predemolition conference.

B. Remove: As indicated.

C. Remove and Salvage/ Save for Reuse: As indicated.

D. Existing to Remain: As indicated, or otherwise not indicated for removal.

END OF SECTION

SECTION 035413 - GYPSUM CEMENT UNDERLAYMENT

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. Nonstructural, self-leveling, gypsum cement underlayment for application below interior floor coverings.
2. Structural foam fill (geofoam).

B. Related Requirements:

1. Section 092900 “Gypsum Board” for coordination of installation at wall base at floors to receive gypsum underlayment.
2. Section 096813 “Tile Carpeting” for substrate preparation requirements.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

C. UL Directory Design Assemblies. Refer to Drawings for assembly requirements.

D. Acoustical Data: Sound assembly testing indicating compliance with indicated requirements. Refer to Drawings for assembly requirements.

E. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place gypsum cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2. UL L593, 1-hour fire rating.

3. UL L505, L511, L536 or L541, 2-hour fire rating.

2.2 GYPSUM CEMENT UNDERLAYMENTS

A. Source Limitations for Gypsum Cement Underlayment: Obtain gypsum cement underlayment materials and primers from single source or materials approved by underlayment manufacturer.

B. Gypsum Cement Underlayment: Self-leveling, gypsum cement products that can be applied in minimum uniform thickness of 1 inch (25 mm).

1. Minimum uniform thickness of 1 inch (25 mm) where used with acoustical mat or resilient underlayment.

2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.

3. Compressive Strength: Not less than 3000 psi (20.7 MPa) tested in accordance with ASTM C 472M.

4. Installed over plastic vapor retarder or barrier or underlayment where recommended by underlayment manufacturer.

C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

D. Reinforcement: For underlayment applied above foam fill substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

2.3 STRUCTURAL FOAM FILL (GEOFOAM)

A. Rigid Cellular Polystyrene Geofoam for Structural Foam Fill: ASTM D6817, Type EPS 29.

1. Density: 1.80-lb/cu. ft. (28.8-kg/ cu. M).

2. Compressive strength: 10.9-psi (75-kPa) compressive strength at 1 percent deformation; 50-psi (345-kPa) flexural strength.

3. Dimensional tolerance: Within 0.5 percent in length, width and thickness.

4. Thickness: As indicated.

B. Connectors: Geofoam manufacturer’s multi-barbed, galvanized-steel sheet connector, as required for application.

C. Basis-of-Design Manufacturers:

1. AFM Corporation; www.geofoam.com.

2. Atlas EPS; www.atlaseps.com.

3. Dyplast Products; www.dyplastproducts.com.

4. Insulfoam; www.insulfoam.com.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.

2. Fill substrate voids to prevent underlayment from leaking.

3.3 GEOFOAM, STRUCTURAL FOAM FILL INSTALLATION

A. Install geofoam blocks in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.

B. Install geofoam connectors at each layer of geofoam to resist horizontal displacement according to geofoam manufacturer's written instructions.

3.4 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.

2. Coordinate application of components to provide optimum adhesion to substrate and between coats.

3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

4. Install as accordance with ASTM F 2419.

B. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to product surface.

C. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

D. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

E. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.5 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

SECTION 06 10 00 - ROUGH CARPENTRY

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. Wood blocking and nailers.
2. Wood furring and grounds.
3. Plywood backing panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominalsize in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominalsize or greater but less than 5 inches nominalsize in least dimension.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

D. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Post-installed anchors.

E. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: S-DRY unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat all rough carpentry unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailers.

3. Furring.

4. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Western woods; WCLIB or WWPA.

C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:

1. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 BLOCKING AND BACKING

A. Provide bidder-designed blocking and backing as necessary to support wall and ceiling mounted equipment, both contractor-furnished/contractor-installed (CFCI) and owner-furnished/contractor-installed (OFCI).

B. Applications: Including but not limited to: Plumbing fixtures, toilet partitions, video monitors, projection screens, wall cabinets, and toilet accessories and other wall mounted fixtures weighing more than 5 lbs.

C. Contractor shall coordinate the required backing installation with equipment or fixture manufacturer's recommendations.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.8 MISCELLANEOUS MATERIALS

A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Provide bidder designed backing or blocking as required to support all specified wall or ceiling mounted equipment (whether owner-furnished or contractor-furnished). Including, but not limited to, plumbing fixtures, toilet partitions, video monitors, projection screens, wall cabinets, display cases, marker chalk and tack boards, toilet accessories, medical equipment, food service equipment, etc. Contractor to coordinate the required backing installation with equipment manufacturer’s backing recommendations.

E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.

2. Use copper naphthenate for items not continuously protected from liquid water.

G. Where wood-preservative-treated lumber is installed adjacent to or in contact with galvanized metal, metal decking, metal framing, or zinc-coated metal, install continuous flexible flashing separator between wood and metal decking.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).

2. ICC-ES evaluation report for fastener.

I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at 24 inches o.c.

3.4 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally and vertically at 24 inches (610 mm) o.c.

3.5 DEFLECTION HEAD CONSTRUCTION

A. Required at the top of all non-bearing wall partitions that occur under open-web type framing members and where required within drawings. Allow minimum 3/4-inch space between top plate of wall and bottom truss chord for deflection tolerance.

3.6 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 41 00 - ARCHITECTURAL CASEWORK

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. Plastic-laminate (PLAM-#).
2. Solid-surface countertops (SS-#).
3. Wood bench (WOOD BENCH, WD-1).
4. Wood slats (WOOD SLATS, WD-2).
5. Wood panels (WP-#)
6. Cabinet hardware and accessories.
7. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 23 82 38 “Unit Heaters” for coordination with built in unit heaters at west entry control desk.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

A. Product Data: For each type of product, including panel products, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural wood cabinets.
4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
5. For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Initial Selection:

1. Wood Panels: 6 by 6 inches, with shop-applied finish to match existing wood panels.

D. Samples for Verification:

1. Plastic Laminates: 6 by 6 inches, for each type.
2. Solid Surfaces: 6 by 6 inches, for each type.
3. Wood Panels: 6 x 6 inches, for each type with surface finish.
4. Wood Trim: 8 inches long with surface finish.
5. Wood Slats: Mock-Up base connection detail, 8 inches high by 3 slats with surface finish, sized and spaced as indicated on drawings.

E. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Fabricator/ Installer Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

C. Overage: Ensure appropriate amount of overage to account for quality requirement; for all WD-# types allow for approximately 25 percent additional materials to allow sorting and rejecting to meet quality requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 17 and 50 percent during the remainder of the construction period.

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood paneling, wood doors with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.

2.2 ARCHITECTURAL CABINETS, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Institute (AWI) "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.3 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Architectural Woodwork Standards Grade: Cabinets shall be built in conformance to Custom Grade, unless specified otherwise.

B. Type of Construction: Frameless.

C. Door and Drawer-Front Style: Flush overlay.

1. Reveal Dimension: As indicated on Drawings.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

E. Laminate Cladding for Exposed Surfaces:

1. Vertical Surfaces: Grade VGS.

a. PLAM-1:

1) Basis-of-Design Manufacturer: Formica; www.formica.com

2) Product: High Pressure Laminate

3) Color: TBD

4) Applications: At control desk as indicated on drawings.

2. Exposed Edges: Same as horizontal surfaces.

3. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.

F. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade CLS.
    a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
    b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.
2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

G. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As selected by Architect from laminate manufacturer's full range.

2.4 COUNTERTOPS AND DESK FRONTS

A. Quality Standard: Architectural Woodwork Standards Grade: Countertops and casework shall be built in conformance to Custom Grade, unless specified otherwise.
1. Provide inspections of fabrication and installation indicating that countertops comply with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. SS-1:
1. Basis-of-Design Manufacturer: Hyundai L&C USA; www.hundailncusa.com.
2. Product: Hannex Solid Surface.
3. Color: M-005 Orange.
4. Thicknesses: 0.25 in for vertical use and 0.5 in for horizontal use.
5. Applications: West Entry Control Desk.

2.5 WOOD BENCH

A. Wood Bench, WD-1:
1. Grade: Premium.
2. Materials: Solid stock glued to full plywood subdeck
    a. Species and Cut: Plain sawn maple.
    b. Thickness: 0.5 in minimum.
    c. Wood trim as indicated; refer to Wood Trim articles in this Section.

3. Finish: Transparent finish; refer to Finishes articles below.

2.6 WOOD WALL PANEL

A. Wood Wall Panel, WP-1:

1. Veneer Species and Cut: Match existing adjacent wall panels.

B. Wood Wall Panel, WP-2:

1. Grade: Premium.
2. Basis-of-Design Manufacturer: Plyboo; www.plyboo.com
3. Product: Edge Grain Plywood BP-V4896A.
4. Thickness: 0.75 in.
5. Color: Amber.
6. Finish: Transparent finish; refer to Finishes articles below.

2.7 WOOD SLATS

A. Wood Slats, WD-2:

1. Grade: Premium.
2. Materials: Solid-stock lumber; dimensions and profiles indicated on drawings.
   a. Species and Cut: Maple.

B. Finish: Transparent finish, semi-matte; refer to Finishes articles below.

2.8 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
2. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130, unless indicated otherwise.
2. Softwood Plywood: DOC PS 1, medium-density overlay.
3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.9 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.

2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.

3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.

4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.

2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.

D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.10 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

1. Basis-of-Design Product: Model No. DP105A/6 by Doug Mockett; www.dougmockett.com.

a. Finish: Satin.

b. Application: Lockers and Cabinets.

D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

G. Drawer Slides: BHMA A156.9.

1. Grade 1: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.

2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.

3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.

4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.

5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.

6. For computer keyboard shelves, provide Grade 1HD-100.

7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.

H. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Door and Drawer Silencers: BHMA A156.16, L03011.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.

2. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.

3. Bright Brass, Vacuum Coated: BHMA 723 for brass base; BHMA 729 for zinc-coated-steel base.

4. Satin Brass, Blackened, Bright Relieved, Clear Coated: BHMA 610 for brass base; BHMA 636 for steel base.

5. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

6. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.

7. Satin Stainless Steel: BHMA 630.

2.11 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.12 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets: 1/16 inch unless otherwise indicated.

C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.

2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.13 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. General: Shop finish transparent-finished architectural wood cabinets at fabrication shop as specified in this Section.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

D. Transparent Finish:

1. Grade: Premium.

2. Finish: System - 5, conversion varnish.

3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.

4. Staining: Clear to match Architect's sample.

5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.

6. Filled Finish for Open-Grain Woods After staining, apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess. Tint filler to match stained wood.

7. Sheen: Flat, 15-30 gloss units measured on 60-degree gloss meter per ASTM D 523 to match Architect’s approved sample.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 CABINET INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. For shop finished items use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

2. Maintain veneer sequence matching of cabinets with transparent finish.

3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.4 COUNTERTOP INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using

adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.

2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

3.5 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 41 00

SECTION 07 84 13 - PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.3 SUBMITTALS

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

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Qualification Data: For qualified Installer.

D. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.

b. Classification markings on penetration firestopping correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."

2) Intertek ETL SEMKO in its "Directory of Listed Building Products."

3) FM Global in its "Building Materials Approval Guide."

D. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire-resistance-rated walls include fire walls fire-barrier walls smoke-barrier walls and fire partitions.

2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Horizontal assemblies include floors floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.

2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.

3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.

2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

H. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

I. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

a. Slag-wool-fiber or rock-wool-fiber insulation.

b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.

c. Fire-rated form board.

d. Fillers for sealants.

2. Temporary forming materials.

3. Substrate primers.

4. Collars.

5. Steel sleeves.

2.2 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and 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.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.3 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.

3. Designation of applicable testing and inspecting agency.

4. Date of installation.

5. Manufacturer's name.

6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

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. Silicone joint sealants.
2. Mildew-resistant joint sealants.
3. Latex joint sealants.

B. Related Requirements:

1. Section 07 84 13 “Penetration Firestopping” for sealants at fire-resistance rated assemblies.
2. Section 09 29 00 “Gypsum Board” for acoustical sealant.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch-(150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

E. Qualification Data: For qualified testing agency.

F. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

G. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.5 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. All openings, gaps, and joints in floor and wall assemblies in contact with soil and at gaps around pipes, toilets, or drains penetrating these assemblies shall be filled or closed with materials that provide a permanent air-tight seal.

B. Only smaller gaps shall be sealed with elastomeric joint sealant, as defined by ASTM C 920; maximum joint width as recommended by sealant manufacturer.

1. Large openings shall not be sealed with elastomeric joint sealant, but rather with nonshrink grout or expanding foam materials; refer to Section 03 30 00 “Cast-in-Place Concrete” for nonshrink grout.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Approved Manufacturers:

a. Dow Corning Corporation; www.dowcorning.com.

b. GE Construction Sealants; Momentive Performance Materials Inc.; www.siliconeforbuilding.com.

c. Sika Corporation; www.sika.com.

2. Applications: Non-porous similar exterior materials.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Approved Manufacturers:

a. Dow Corning Corporation; www.dowcorning.com.

b. GE Construction Sealants; Momentive Performance Materials Inc.; www.siliconeforbuilding.com.

c. Tremco Incorporated; www.tremco.com.

2. Applications: At joints in ceramic tile walls and floor, around equipment and around plumbing fixtures.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Basis-of-Design Product: Tremco Acrylic Latex Caulk.

2. Applications: At interior frames/ walls.

2.6 LOW EXPANDING FOAM SEALANTS

A. Low expanding, one-component, polyurethane foam sealant, curing to a semi-rigid, closed cell urethane foam.

1. Applications:

a. Miscellaneous openings and voids in exterior walls.

b. Large openings, gaps, and joints in floor and wall assemblies in contact with soil and at gaps around pipes, toilets, or drains penetrating these assemblies.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

   a. Concrete.

   b. Masonry.

   c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

   a. Metal.

   b. Glass.

   c. Porcelain enamel.

   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 PATCHING VOIDS

A. At above-grade applications, inject elastomeric joint sealants into all smaller openings, gaps, and joints in floor and wall assemblies in contact with soil and at gaps around all pipes, toilets, bathtubs, or drains penetrating these assemblies so no voids remain and to provide a permanent air-tight seal.

B. Where appropriate, larger gaps shall be sealed with nonshrink grout or expanding foam; refer to Section 03 30 00 “Cast-in-Place Concrete”.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

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 hollow-metal doors and frames.

B. Related Requirements:

1. Section 08 14 16 “Flush Wood Doors” for coordination with frames.
2. Section 08 71 00 “Door Hardware” for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.6 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical and horizontal-edge details and metal thickness.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

D. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

E. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each unit to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratingsindicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A. At interior locations as scheduled.

1. Doors:

a. Type: As indicated in the Door Schedule.

b. Thickness: 1-3/4 inches (44.5 mm).

c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053.

d. Edge Construction: Model 1, Full Flush.

e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion. Steel stiffeners are not permitted where telegraphing through door facing and shall be rejected.

2. Frames:

   a. Materials: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch (1.3 mm).

   b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.

   c. Construction: Face welded.

3. Exposed Finish: Prime.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.

2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).

3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

2.5 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

H. Glazing: Comply with requirements in Section 088000 "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

J. Metal-Patching Compound: Two-part, polyester-resin metal-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated because of corrosion. Filler shall be capable of filling deep holes and spreading to feather edge. Provide Bondo by 3M or equal.

2.6 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation. Steel stiffeners or their attachement shall not telegraph through face.

2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.

3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.

4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.

5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.

   a. Provide closure profiles required for acoustical door hardware. Coordinate requirements with Section 08 71 00.

6. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

4. Jamb Anchors: Provide number and spacing of anchors as follows:

   a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:

      1) Two anchors per jamb up to 60 inches (1524 mm) high.

      2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.

      3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.

4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Three anchors per jamb up to 60 inches (1524 mm) high.

2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.

3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.

4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

5. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

7. Terminated Stops: Terminate stops [6 inches (152 mm)] above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.

2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.

3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce frames to receive nontemplated, mortised, and surface-mounted hardware.

2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.7 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap frames to receive nontemplated, mortised, and surface-mounted hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.

    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

    c. Install frames with removable stops located on secure side of opening.

    d. Install door silencers in frames before grouting.

    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.

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 mineral-fiber insulation.

5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.

7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

   b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

   c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

   d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

   a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

   b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).

   c. At Bottom of Door: As indicated on Drawings.

   d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 081416 - FLUSH WOOD 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. This Section includes the following:

1. Solid-core doors with wood-veneer faces.

B. Related Requirements:

1. Section 08 11 13 “Hollow Metal Doors and Frames” for wood doors in steel frames.
2. Section 08 71 00 “Door Hardware” for door hardware for flush wood doors.
3. Section 08 80 00 “Glazing” for glass view panels in wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:

1. Faces of Factory-Finished Doors: Show the full range of colors available for stained and opaque finishes.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 200 by 250 mm (8 by 10 inches), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, approximately 200 by 250 mm (8 by 10 inches), with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: After five minutes into the test, the neutral pressure level in furnace shall be established at 1000 mm or less above the sill.

2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.

3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 250 deg C maximum in 30 minutes of fire exposure.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Contractor’s Quality Control.”

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting package and deliver as required.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 16 and 32 deg C and relative humidity between 43 and 70 percent during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION, GENERAL

A. Doors for Transparent Finish:

1. Grade: Custom (Grade A faces).

2. Species and Cut: Match existing.

3. Match between Veneer Leaves: Match existing.

4. Assembly of Veneer Leaves on Door Faces: Match existing.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

6. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 3 m or more.

7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.

8. Stiles: Applied wood-veneer edges of same species as faces and covering edges of faces.

2.2 SOLID-CORE DOORS

A. Interior Veneer-Faced Doors:

1. Core: Either glued or nonglued block or structural composite lumber.

2. Construction: Seven plies, either bonded or nonbonded construction.

B. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.

2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.

a. 125-mm top-rail blocking.

b. 125-mm bottom-rail blocking, in doors indicated to have protection plates.

c. 125-mm midrail blocking, in doors indicated to have armor plates.

d. 125-mm midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.

4. Pairs: Furnish formed-steel edges and astragals with intumescent seals for pairs of fire-rated doors, unless otherwise indicated.

5. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

2.3 LIGHT FRAMES AND GLAZING

A. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:

1. Wood Species: Same species as door faces.

2. Profile: Manufacturer’s standard lipped profile. At wood core doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.

2.4 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

2.5 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces and edges of doors, including cutouts, with one coat of wood primer specified in Division 09 Section "Painting."

B. Doors for Transparent Finish: Shop seal faces and edge of doors, including cutouts, with stain (if required), other required pretreatments, and first coat of finish as specified in Division 09 Section "Painting."

2.6 FACTORY FINISHING

A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.

B. Finish doors at factory where indicated in schedules or on Drawings as factory finished.

C. Transparent Finish:

1. Grade: Custom.

2. Finish: AWI System TR-6 catalyzed polyurethane.

D. Opaque Finish:

1. Grade: Custom.

2. Finish: AWI System OP-2 catalyzed lacquer.

3. Sheen: As selected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.

2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Sections "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Clearances: Provide 3.2 mm at heads, jambs, and between pairs of doors. Provide 3.2 mm from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 6.4 mm from bottom of door to top of threshold.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 3-1/2 degrees at lock and hinge edges.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

F. Field-Finished Doors: Refer to the following for finishing requirements:

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceiling access doors and frames.

1.2 SUBMITTALS

A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.

B. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:

1. Method of attaching door frames to surrounding construction.

2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors.

2. ASTM E 119 or UL 263 for horizontal access doors and frames.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.

C. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316; with minimum sheet thickness indicated representing specified thickness according to ASTM A 480/A 480M.

E. Drywall Beads: Edge trim formed from 0.03-inch (0.76-mm) zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

F. Plaster Bead: Casing bead formed from 0.03-inch (0.76-mm) zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.

2.2 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.

2.3 ACCESS DOORS AND FRAMES

A. Recessed Access Doors and Trimless Frames: Fabricated from metallic-coated steel or stainless-steel sheet.

1. Locations: Gypsum board and acoustical-tile wall and ceiling surfaces.

2. Door: Minimum 1/16-inch- (1.5-mm-) thick sheet metal in the form of a pan recessed 5/8 inch (16 mm) for gypsum board acoustical-tile infill.

3. Frame: Minimum 1/16-inch- (1.5-mm-) thick sheet metal with only frame edge exposed in acoustical ceiling surfaces.

4. Hinges: Concealed pivoting rod hinge.

5. Lock: Key-operated cylinder lock**.**

a. Basis-of-Design Manufacturer: Best, div. of Dormakaba Group; www.bestaccess.com.

6. Finish: Primed for field painting, match adjacent walls or ceiling as approved by Architect.

B. Size: Access panel sizes shall be sized to accommodate the removal of largest piece of equipment in that space.

1. 8 inch x 8 inch, 12 inch x 12 inch, 16 inch x 16 inch, 30 inch x 30 inch, 36 inch x 48 inch and as indicated.

2.4 SCHEDULE

A. Owner Standards: Provide access doors and frames as follows:

1. Access panel shall be, at a minimum 36 inch x 48 inch where the equipment or device is less than 18 inch from the finished ceiling.

2. Use 36 inch x 48 inch access panels where the equipment or device is more than 18” from the finish ceiling and where equipment or device has a panel or door that needs to be opened or removed for service.

3. Use a minimum of 8 inch x 8 inch access panels in walls to access valves or other appurtenances.

4. Final location and size of access panels shall be reviewed and approved during an on-site review by OSU Project Manager, EH&S construction safety officer, and applicable Shop prior to framing block-out and installation of access doors and frames.

2.5 FABRICATION

A. General: Provide access door assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: Nominal 1 to 1-1/2 inches (25 to 38 mm) wide around perimeter of frame.

2. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.

D. Provide stainless steel access doors and frame assemblies at ceramic tile wall locations.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.7 STEEL FINISHES

A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

2.8 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 PREPARATION

A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 INSTALLATION

A. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

B. Install recessed finish material.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. OSU Design and Construction Standards.

1.2 SUMMARY

A. Section includes:

1. Mechanical door hardware.
2. Electrified door hardware.
3. Metal thresholds.

B. Related Requirements:

1. Section 08 11 13 “Hollow Metal Frames”.
2. Section 08 14 16 “Flush Wood Doors.”
3. Section 13 42 75 “Integrated Interior Assemblies.”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: For power, signal, and control wiring and including the following:
   a. Details of interface of electrified door hardware and building safety and security systems.
   b. Schematic diagram of systems that interface with electrified door hardware.
   c. Point-to-point wiring.
   d. Risers.
   e. Elevations doors controlled by electrified door hardware.
2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

C. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
2. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.

3. Content: Include the following information:

   a. Identification number, location, hand, fire rating, size, and material of each door and frame.

   b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.

   c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.

   d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.

   e. Fastenings and other pertinent information.

   f. Explanation of abbreviations, symbols, and codes contained in schedule.

   g. Mounting locations for door hardware.

   h. List of related door devices specified in other Sections for each door and frame.

D. Keying Schedule: Coordinate requirements with owner.

E. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

F. Warranty: Special warranty specified in this Section.

G. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

   1. Warehousing Facilities: In Project's vicinity.

   2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

   3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Source Limitations: Obtain each type of door hardware from a single manufacturer.

   1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

C. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

D. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

   1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

F. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

G. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1, HUD's "Fair Housing Accessibility Guidelines", Uniform Federal Accessibility Standards (UFAS), ANSI A1117.1 2003, NFPA 101 and Florida Structural Specialty Code (Current Edition).

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:
    a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high and 3/4 inch high for exterior sliding doors.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

H. Keying Conference: Conduct conference at Project site. In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

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.

I. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys and permanent cores 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 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 hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.

b. Faulty operation of doors and door hardware.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

a. Electromagnetic Locks: Five (5) years from date of Substantial Completion.

b. Manual Closers: Thirty (30) years from date of Substantial Completion.

c. Locksets: Five (5) years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products and products complying with BHMA designations referenced.

2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.

2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

3. When only one manufacturer is listed, provide the product indicated in the Hardware Schedule. Asterisk * indicates manufacturer listed in hardware schedule.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. *IVES Hardware; div. of Allegion.

b. McKinney Hardware; div. of Assa Abloy.

c. Stanley Commercial Hardware; Div. of The Stanley Works.

d. Approved Substitution.

2.3 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Locks: Minimum 3/4-inch latchbolt throw.

2. Deadbolts: Minimum 1-inch bolt throw.

C. Lock Backset: 2-3/4 inches, unless otherwise indicated.

D. Lock Trim:

1. Operating Device: Lever with escutcheons (roses).

E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch. Dust proof.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

F. Mortise Locks: BHMA A156.13; Security Grade 1; stamped steel case with steel or brass parts; Series 1000.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Owner Standard: Schlage Commercial Lock Division; div. of Allegion.

2.4 ELECTROMECHANICAL LOCKS

A. Electromechanical Locks: BHMA A156.25; Grade 1; motor or solenoid driven; mortise deadlocking latchbolt; with strike that suits frame.

2.5 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.
    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        a. *IVES Hardware; div. of Allegion.
        b. Door Controls International, Inc.
        c. Trimco.

2.6 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.
    a. Owner Standard: Von Duprin, div. of Allegion.

2.7 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
    1. Manufacturer: Best.

B. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are removable; face finished to match lockset.

C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

2.8 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
    1. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.

B. Keys: Nickel silver.
    1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
        a. Notation: "DO NOT DUPLICATE" or as required by Owner.
    2. Quantity: In addition to one extra key blank for each lock, provide the following:
        a. Cylinder Change Keys: Five.
        b. Master Keys: Five.
        c. Grand Master Keys: Five.

2.9 KEY CONTROL SYSTEM

A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of number of doors on project plus 10 percent of the number of locks.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Key Boxes and Cabinets.

b. GE Security, Inc.

c. Lund Equipment Co., Inc.

d. MMF Industries.

2. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

B. Key Lock Boxes: Designed for storage of two keys, with tamper switches to connect to intrusion detection system.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. GE Security, Inc.

b. HPC, Inc.

c. Knox Company.

C. Key Control System Software: BHMA A156.5, Grade 1; multiple-index system for recording and reporting key-holder listings, tracking keys and lock and key history, and printing receipts for transactions. Include instruction manual.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Best Access Systems; Div. of Stanley Security Solutions, Inc.

b. GE Security, Inc.

c. HPC, Inc.

2.10 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Owner Standard: LCN; div. of Allegion.

2.11 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. *Ives Hardware; div. of Allegion.

b. Trimco.

2.12 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. *Zero; div. of Allegion.

b. National Guard Products.

c. Pemko Manufacturing Co.; div. of Assa Abloy.

2.13 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Basis-of-Design Product: Refer to “Threshold Details” in the Drawings for product and manufacturer information, or as selected by Architect.

2.14 POWER SUPPLIES, POWER TRANSFERS

A. General: BHMA A156.14; Provide as listed in hardware groups. Verify quantities.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. *Von Duprin; div. of Allegion.

2.15 KICK PLATES

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. *Ives Hardware; div. of Allegion.

b. Trimco.

2.16 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not

permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:
    a. Wood or Machine Screws: For the following:
        1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
        2) Strike plates to frames.
        3) Closers to doors and frames.
    b. Steel Through Bolts: For the following unless door blocking is provided:
        1) Surface hinges to doors.
        2) Closers to doors and frames.
        3) Surface-mounted exit devices.
3. Spacers: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.17 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Finish: All hardware shall have BHMA 630 (US 32D) stainless finish, or to match if material other than stainless steel, unless noted otherwise.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine 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.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

A. Mounting Heights: 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. Fiberglass and Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

E. Lock Cylinders: Provide construction masterkeying for the construction period.

1. Void construction keying as directed by Owner.

F. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

G. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with Architect.

1. Configuration: Provide one power supply for each door opening with electrified door hardware.

H. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."

I. 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 will impede traffic.

J. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

K. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

L. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 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 is allowed to 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 months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

END OF SECTION

SECTION 08 71 00.01 - DOOR HARDWARE INDEX

Door Hardware Index

Area#	Door Numbers	HwSet#
	211A-1	01
	223-3	02
	121-1	06

Door Hardware Index – Integrated Interior Assemblies

Area#	Door Numbers	HwSet#
	109-1	03
	109A-1	04
	109B-1	04
	109C-1	04
	109D-1	05
	109F-1	04
	113-1	03
	113A-1	04
	113B-1	04
	113C-1	04
	113D-1	04
	113E-1	04
	113F-1	04
	211P-1	04
	211Q-1	04

END OF SECTION

SECTION 08 71 00.02 - DOOR HARDWARE SETS

HW SET # 01

Openings

211-1

Each door or doors to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	TA2714 4.5X4.5	626	MK
1	EA	CLASSROOM LOCK	ND94PD-SPA	626	SCH
1	EA	PERMANENT CORE	1C7 VERIFY, VERIFY KEYWAY	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	GASKETING	488SBK PSA	BK	ZER

CLOSER MOUNTED ON PUSH SIDE

PROVIDE TEMPORARY CORE, PERMANENT CORE BY OWNER

HW SET # 02

Openings

223-3

Each door or doors to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	TA2714 4.5X4.5	626	MK
1	EA	STOREROOM LOCK	ND96PD-SPA	626	SCH
1	EA	PERMANENT CORE	1C7 VERIFY, VERIFY KEYWAY	626	BES
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	GASKETING	488SBK PSA	BK	ZER

PROVIDE TEMPORARY CORE, PERMANENT CORE BY OWNER

HW SET # 03 – INTEGRATED INTERIOR ASSEMBLIES DOOR

Openings

109-1, 113-1
Each door or doors to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	TA2714 4.5X4.5	626	MK
1	EA	ELECTRIC POWER TRANSFER	EPT-10-CON	689	VON
1	EA	WIRE HARNESS	CON-6W		SCH
1	EA	WIRE HARNESS	CON-192P, VERIFY LENGTH		SCH
1	EA	POWER SUPPLY	PS902		VON
1	EA	LOCKSET	ND80PDEL-RHO	626	SCH
1	EA	PERMANENT CORE	1C7 VERIFY, VERIFY KEYWAY	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	CARD READER MULLION MOUNT	MT11	BK	SCH

CLOSER MOUNTED ON PUSH SIDE

PREP FRAME FOR INSTALL OF FUTURE LOW VOLTAGE ROOM SCHEDULING INTERFACE

PROVIDE TEMPORARY CORE, PERMANENT CORE BY OWNER

HW SET # 06

Openings

121-1
Each door or doors to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	TA2714 4.5X4.5	626	MK
1	EA	PROGRAMABLE LOCK	SALVAGED EXISTING		
1	EA	PERMANENT CORE	1C7 VERIFY, VERIFY KEYWAY	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	GASKETING	488SBK PSA	BK	ZER

CLOSER MOUNTED ON PUSH SIDE

PROVIDE TEMPORARY CORE, PERMANENT CORE BY OWNER

HW SET # 04 – INTEGRATED INTERIOR ASSEMBLIES DOOR

Openings

109A-1, 109B-1, 109C-1, 109F-1, 113A-1, 113B-1, 113C-1, 113D-1, 113E-1, 113F-1, 211P-1, 211W-1
Each door or doors to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PERMANENT CORE	1C7 VERIFY, VERIFY KEYWAY	626	BES
1	EA	MORTISE CYLINDER	1E-74	626	BES
1	EA	SLIDER TRACK W/ SOFT CLOSE	BARIVOT BARN DOOR SLIM TRACK	MATCH DOOR	
2	EA	PULLS	72” X 56” C TO C BAR PULL	630	

PROVIDE TEMPORARY CORE, PERMANENT CORE BY OWNER

HW SET # 05 – INTEGRATED INTERIOR ASSEMBLIES DOOR

Openings

109D-1
Each door or doors to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PERMANENT CORE	1C7 VERIFY, VERIFY KEYWAY	626	BES
1	EA	MORTISE CYLINDER	1E-74	626	BES
1	EA	DOUBLE SLIDER TRACK W/ SOFT CLOSE	DOUBLE BARN DOOR V4 TRACK	MATCH DOOR	
1	EA	PULL	72” X 56” C TO C BAR PULL	630	

PROVIDE TEMPORARY CORE, PERMANENT CORE BY OWNER

END OF SECTION

SECTION 08 80 00 - GLAZING

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. Glass for interior glazed assemblies and doors (GL-1).
2. Decorative film overlay for various glazing types (WF-1).
3. Mirror glass (MR-1) at walls.
4. Glazing sealants and accessories.

B. Related Requirements:

1. Section 13 42 75 “Integrated Interior Assemblies” for coordination with premanufactured interior assemblies.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.6 SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency and sealant testing agency.

F. Product Certificates: For glass.

G. Product Test Reports: For tinted glass, coated glass, insulating glass and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

H. Preconstruction adhesion and compatibility test report.

I. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications for Glazing with Sputter-Coated, Low-E Coatings: A qualified glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

C. Basis-of-Design Manufacturer: Vitro Architectural Glass; www.vitroglazings.com.

D. Other Approved Manufacturers:

1. AGC Glass North America; www.agcglass.com.

2. Oldcastle Building Envelope; www.obe.com.

3. Pilkington, a div. of Nippon Sheet Glass Co., Ltd; www.pilkington.com.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publication: "Glazing Manual."

2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."

3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Mirror Glass: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied, Quality Q1 (mirror select).

1. Silvered Flat Glass Mirrors, Acceptable Manufacturers:

a. Gilded Mirrors, Inc.; www.gildedmirrorsinc.com.

b. Walker Glass Co., Ltd.; www. walkerglass.com.

2. Mirror Mastic, Acceptable Manufacturers:

a. Franklin Intl.; www.titebond.com.

b. C.R. Laurence, Co., Inc.; www.crlaurence.com

c. Macco Adhesives; www.liquidnails.com.

d. OSI Sealants, Inc.; www.ositough.com.

e. Palmer Products Corp.; www. mirro-mastic.com.

f. Pecora Corp.; www.pecora.com.

g. Royal Adhesives & Sealants; www.royaladhesives.com

3. Edge Profiles: Ground, polished unless indicated otherwise.

4. Where existing units are fabricated mirrors, mirror glass indicated above is not applicable.

2.5 DECORATIVE FILM, WF-1

A. Decorative Film Overlay: Translucent, dimensionally stable film, with pressure-sensitive, clear adhesive back for adhering to glass and releasable protective backing.

1. Fire Classification: Class A.

2. Basis-of-Design Product: TBD by 3M Fasara Glass Finishes; www.3m.com.

a. Finish: Frost/ matte.

b. Film Thickness: 3.2 mils.

c. Visible Light Reflectance (VLR): 79 percent.

d. Visible Light Transmittance (VLT): 85 percent.

3. Orientation: Install decorative film toward public side.

4. Application: Provide at various glazing types as indicated in Drawings.

2.6 GLAZING TYPES

A. Glazing Type, GL-1: Structural, monolithic, clear interior glazing.

1. Fully tempered or heat-strengthened where code required.

2. Outer Lite: 3/8 inch (10 mm), or as indicated on drawings, clear float glass.

3. Safety glazing required.

B. Glazing Type, MR-1: Mirrored, monolithic interior single lites.

1. Mirror Glass: ASTM C 1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select); Fully tempered; 1/4-inch (6-mm) minimum thick.

a. Select material thickness and/ or provide supports as required to limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

b. Sizes as indicated in Drawings.

2. Safety glazing required.

3. Applications:

a. Mirror glass (MR-1) at walls.

b. Provide additionally for mirrors within lockers, as indicated.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class as applicable to application, Use NT.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.

2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

C. Adhesive Glazing Tape and Foam Tapes: Preformed, adhesive tape for applications indicated.

1. Basis-of-Design Product: VHB Tapes by 3M; multimedia.3m.com.

a. Family: As recommended by manufacturer in writing for substrates and applications indicated.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

D. Decorative Film Overlay: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in pattern indicated on Drawings to the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Minimum required face and edge clearances.

3. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Delegated design.

B. Related Requirements:

1. Section 01 61 16 “Delegated Design Requirements”.
2. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs, and resilient channels used in exterior walls.
3. Section 06 10 00 “Rough Carpentry” for fire retardant-treated wood blocking.
4. Division 08 “Openings” Sections for coordinating opening requirements.
5. Section 09 29 00 “Gypsum Board” for coordination with panel installation, panel materials, and acoustic wall closures at mullions.
6. Section 10 28 00 “Restroom and Custodial Accessories” for coordinating blocking required for wall-mounted equipment.
7. Division 21 “Fire Suppression” Sections for fire sprinkler work to be coordinated with soffit framing and ceiling suspension systems.
8. Division 23 “HVAC” Sections for ducts, diffusers and other mechanical work to be coordinated with soffit framing and ceiling suspension systems.
9. Division 26 “Electrical” Sections for lighting work to be coordinated with soffit framing and ceiling suspension systems.
10. Division 28 “Electrical Safety and Security” Sections for fire alarm work to be coordinated with soffit framing and ceiling suspension systems.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

B. Delegated-Design Submittal: For components 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 QUALITY ASSURANCE

A. Structural Design: Structural elements shall be designed by a structural engineer licensed to practice in the State in which the Project is located.

1.5 COORDINATION

A. Coordination of Wall Support With Building Structure and Other Building Systems: Where direct anchorage to building structure is impractical due to dimensional restriction, conflict with HVAC, plumbing, electrical or other considerations provide fully engineered design for wall support assembly. Coordinate with HVAC, Plumbing, electrical fire protection and all other building systems to identify potential areas of conflict for ceiling anchorage and prepare engineered solution in advance of installation.

1. Do not attach metal framing to plenum construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 "Delegated Design Requirements," to design non-structural framed walls and soffits.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: For wall assemblies less than 20 feet total unsupported height, limited to L/240 of the wall height based on horizontal loading of5 lbf/sq. ft. (240 Pa).

1. For wall assemblies 20 feet or more total unsupported height, limited to L/360 of the wall height based on horizontal loading of 5 lbf/sq. ft. (240 Pa).

D. Vertical Deflection: Match horizontal deflection requirements.

E. Framing Spacing: As required for wall equipment and finishes indicated.

1. Limit framing at walls scheduled to receive level 4 and 5 finishes, and tile finishes to 16-inches o.c. maximum.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

a. Provide G60 (Z180) where adjacent to exterior framing or concrete walls or structure.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: As required by performance requirements.

b. Depth: As indicated on Drawings.

2. Embossed Steel Studs and Runners:

a. Minimum Base-Metal Thickness: As required by performance requirements.

b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing 2-inch minimum vertical movement.

2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.

1. Depth: As indicated on Drawings.

2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: As required by performance requirements.

2. Depth: As indicated on Drawings.

F. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: As indicated on Drawings.

2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.

3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Hanger Attachments to Concrete:

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.

2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.

1. Depth: 2 inches.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.

2. Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: As required by performance requirements.

b. Depth: As indicated on Drawings.

3. Embossed Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: As required by performance requirements.

b. Depth: As indicated on Drawings.

4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base-Metal Thickness: As required by performance requirements.

5. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped].

G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.

2. Multilayer Application: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb unless otherwise indicated.

b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:

1. Screw to framing.

2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c. or as indicated by delegated designer.

F. Z-Shaped Furring Members:

1. Erect insulation vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.

2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring

channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

H. At thin-brick installation, tolerance shall not vary more than 1/4-inch in 10 feet, noncumulative.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.

2. Carrying Channels (Main Runners): 48 inches o.c.

3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 09 29 00 - GYPSUM BOARD

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 gypsum board.
2. Trim accessories.
3. Acoustic insulation.
4. Acoustical sealant.
5. Finishing.

B. Related Requirements:

1. Section 06 10 00 “Rough Carpentry” for coordinating backing and blocking requirements.
2. Section 09 22 16 “Non-Structural Metal Framing” for coordinating backing and blocking requirements.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For casing beads, moldings, panel transitions and closure profiles.

1. Include elevations showing typical and unique conditions, openings, reveals, panel edges, control and expansion joints and transitions.
2. Show details of special conditions and Project specific details.
3. Show details of wall closures and terminations.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:
   a. Level 4 of gypsum board finish indicated for use in exposed locations.
   b. As associated with the wall paneling or applied finishes.
2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Approved Manufacturers:

1. American Gypsum; www.americangypsum.com.

2. CertainTeed Corp.; www.certainteed.com.

3. Georgia Pacific; www.gp.com.

4. National Gypsum Co.; www.nationalgypsum.com.

5. PABCO Gypsum; www.pabcogypsum.com.

6. United States Gypsum Co. (USG); www.usg.com.

7. Products listed in UL assemblies and required for rated-wall assemblies.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard, General: Do not provide 1/2 in. (12.7 mm), regular type gypsum board at walls. All gypsum wall board material is to be type 'X' and 5/8 in. thickness unless otherwise indicated.

B. Gypsum Board, Type X: ASTM C1396.

1. Thickness: 5/8 in.

2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

3. Applications: Provide at the following locations and others as indicated:
    a. All walls scheduled for gypsum wall board.
    b. Rated partitions.
    c. Rated ceilings and soffits.

C. Gypsum Ceiling Board: ASTM C1396.
1. Thickness: 1/2 in.
2. Long Edges: Tapered.
3. Applications: Provide at the following locations and others as indicated:
    a. Ceiling and soffit finishes indicated, non-rated.

2.4 BLOCKING AND BACKING

A. Coordinate with Section 06 10 00 “Rough Carpentry”.

B. Provide bidder-designed blocking and backing as necessary to support wall and ceiling mounted equipment, both contractor-furnished/contractor-installed (CFCI) and owner-furnished/contractor-installed (OFCI).

C. Applications: Including but not limited to: Plumbing fixtures, toilet partitions, video monitors, projection screens, wall cabinets, and toilet accessories and other wall mounted fixtures weighing more than 5 lbs.

D. Contractor shall coordinate the required backing installation with equipment or fixture manufacturer's recommendations.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.
1. Shapes:
    a. Cornerbead.
    b. Bullnose bead.
    c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    d. L-Bead: L-shaped; exposed long flange receives joint compound.
    e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    f. Expansion (control) joint.
    g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
2. Finish:
    a. Where indicated to be field-painted: Corrosion-resistant primer compatible with joint compound and finish materials specified.
    b. Where indicated to be factory-painted: Baked-enamel finish.
    c. Where indicated to retain factory anodized finish: Class II anodic finish.
3. Basis-of-Design Manufacturers:
    a. Fry Reglet; www.fryreglet.com.

b. Milgo Bufkin; www.milgo-bufkin.com.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475.

B. Joint Tape:

1. Interior Gypsum Board: Fiberglass mesh.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer and compatible with tile applications. Do not use gypsum compound.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Acoustic Insulation; Mineral-Wool Batt, Unfaced: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics; R-13.5 minimum. No added formaldehyde.

1. Basis-of-Design Product: Acoustical Fire Batt (AFB) evo by Rockwool; www.rockwool.com.

E. Neoprene Isolation Gasket Tape: Closed cell foam, pressure-sensitive-adhesive (PSA).

F. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Coordinate with Section 07 92 00 “Joint Sealants” requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. General: Comply with ASTM C840.

1. Where piping passes through the walls, and slabs, there shall not be contact between piping and surrounding materials. Piping openings shall be oversized for the full depth of the opening and lined with neoprene isolation. Use resilient caulk to provide an airtight seal at all penetrations through walls with a “Smoke” or "S" designation in the wall type.

2. Provide continuous acoustical sealant, acoustical insulation and/ or sound attenuation blankets around all penetrations in gypsum board systems, at both sides, including but not limited to penetrations for conduit, ductwork, piping, and structural members.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 in. of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-in.-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-in.-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with

manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

1. Comply with manufacturer’s installation instruction for installing acoustic gypsum board panels.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: All vertical surfaces, including where required for fire-resistance-rated assembly, unless otherwise indicated.

2. Ceiling Type: Ceiling surfaces.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 in. minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

a. Exception: Where required by Code for fire-resistance-rated assemblies, fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum

board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

1. Locate trim profiles in approved shop drawing submittal.

B. Control Joints: Install control joints at locations indicated on Drawings, or if not indicated, according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.

2. LC-Bead: Use at exposed panel edges.

3. L-Bead: Use where indicated.

4. U-Bead: Use where indicated.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. At storage, mechanical, electrical and other utility rooms, walls, and ceilings: Gypsum board, level 3 finish.

2. At all other areas, walls, and ceilings: Gypsum board level 4 finish.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

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. Acoustical tile ceilings and suspension systems (ACT-#).
2. Trim and miscellaneous accessories.

B. Related Requirements:

1. Division 21 “Fire Suppression” Sections for coordination with fire suppression sprinklers.
2. Division 23 “Heating, Ventilating and Air Conditioning” Sections for coordination with air diffusers and returns in ceiling.
3. Division 26 “Electrical” Sections for coordination with lighting fixtures in ceiling.
4. Division 27 “Communications” Sections for coordination with audio-visual components in ceiling.
5. Division 28 “Electronic Safety and Security” Sections for coordination with Fire Detection and Alarm System.

1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance Coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Shop Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension members.
2. Method of attaching hangers to building structure.
    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of samples of each type, color, pattern, and texture. Submit full-size for most panel types; submit partial panel sample may be submitted for 24 x 24 inch (600 by 600 mm) for larger panels.

2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- (long Samples of each type, finish, and color.

D. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 5 percent of quantity of each type installed. Coordinate with owner’s representative and architect.

1.6 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.

2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Pre-installation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels to avoid soiling exposed surfaces or damaging surfaces and edges.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

B. Sequence work to assure that acoustical ceilings are not installed until building is enclosed, permanent heating system is available, dust generating activities have terminated, wet work is complete and dry, and work above ceilings is complete.

1.9 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.10 WARRANTY

A. Provide manufacturer's standard written thirty (30) year limited warranty for acoustical panels and suspension grid.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 “Delegated Design Requirements,” to design suspension systems.

B. Seismic Standard: Provide acoustical panel ceilings conforming to the requirements of Chapter 16 of the Oregon Structural Specialty Code, and designed and installed to withstand the effects of earthquake motions for Seismic Design Category “D”, according to the following:

1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures", Section 13 .5 .6 Suspended Ceilings.
2. ASTM C635/C635M, “Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels”.
3. ASTM C636/C636M, “Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings”.
4. ASTM E580/E580M, “Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions”.

C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance according to one of the following standards, or another testing and inspecting agency acceptable to authorities having jurisdiction:
    a. ASTM E 119 "Test Methods for Fire Tests of Building Construction and Materials."
    b. Underwriters Laboratory (UL) "Fire Resistance Directory."
2. Identify materials with appropriate markings of applicable testing and inspecting agency.
3. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with one of the following:
    a. ASTM E 1264 "Standard Classification for Acoustical Ceiling Products" for Class A materials as determined by testing identical products per ASTM E 84 "Standard Test Method for Surface Burning Characteristics of Building Materials":
        1) Smoke-Developed Index: 50 or less.

D. Acoustic Performance: Refer to Acoustic Performance at individual Product articles below.

2.2 MANUFACTURERS

A. Basis-of-Design Manufacturer: Armstrong: www.armstrong.com.

2.3 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated. Comply with one of the following standards:

1. ASTM E 1264 "Standard Classification for Acoustical Ceiling Products."

a. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 16 inches (400 mm) away from test surface per ASTM E 795 "Standard Practice for Mounting Test Specimens During Sound Absorption Tests."

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Appearance characteristics of acoustical panels are indicated by referencing designations of ASTM E 1264 "Standard Classification for Acoustical Ceiling Products." Provide products selected by Architect from manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail and size. Products that do not list ASTM E 1264 characteristics shall be tested by the product manufacturer's laboratory and shall meet comparable ASTM E 1264 standards for country of origin.

C. Coating-Based Antimicrobial Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to one of the following standards:

1. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber."

2.4 ACOUSTICAL TILE CEILINGS

A. Basis-of-Design Acoustical Panel Product, ACT-1: Armstrong Ultima Beveled Tegular 1914.

1. Ceiling Panel:

a. Edge Detail: 15/16 in. square lay-in.

b. Thickness: 5/8 in.

c. Size: 24 x 48 inches.

d. Panel Color: “White (WH)”.

e. Light Reflectance: Not less than 0.80.

f. NRC: Not less than 0.55.

g. CAC: Not less than 35.

2. Suspension and Trim System:

a. Suspension: 15/16 in. Prelude by Armstrong.

1) Duty Rating: Heavy Duty.

b. Color: White, or as selected by Architect.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Not less than 70 percent.

B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements of one of the following standards:

1. ASTM C 635 "Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings."

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

1. High-Humidity Finish: Comply with one of the following standards:

a. ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

D. Attachment Devices: Size for five times the design load indicated in one of the following:

1. ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

a. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements" or ASTM E 1512 "Standard Test methods for Testing Bond Performance of Bonded Anchors" as applicable, conducted by a qualified testing and inspecting agency.

b. Type: Cast-in-place anchors.

c. Type: Postinstalled expansion anchors.

d. Corrosion Protection: Stainless-steel components complying with ASTM F 593 "Standard Specification for Stainless Steel Bolts, Hex, Cap Screws and Studs" and ASTM F 594 "Standard Specification for Stainless Steel Nuts" or ISO 3506-2:1997 "Mechanical Properties of Corrosion-Resistant Stainless Steel Fasteners-Nuts." Group 1 alloy 304 or 316 for bolts; alloy 304 or 316 for anchor.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190 "Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members", conducted by a qualified testing and inspecting agency.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: Comply with one of the following:

a. ASTM A 641/A 641M, "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire", Class 1 zinc coating, soft temper.

2. Nickel-Copper-Alloy Wire: Comply with one of the following:

a. ASTM B 164 "Standard Specification for Nickel-Copper Alloy Rod, Bar and Wire", nickel-copper-alloy UNS No. N04400.

3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less 12 gauge.

F. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

G. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04 inch- (1-mm-) thick, galvanized steel sheet complying with coating designation from one of the following standards; Provide bolted connections and 5/16 inch (8-mm-) diameter bolts.

1. ASTM A 653/A 653M "Standard specification for Sheet Steel, zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot Dip Process"; Z275.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

J. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.

K. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.

2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

B. Perimeter Trim: Provide perimeter trim at cloud ceilings and ceilings that do not extend to walls.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with one of the following:

1. ASTM C 636 "Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels" and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three 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. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical, or power-actuated fasteners that extend through forms into concrete.

6. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

D. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.

4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

6. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.

7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Testing Services: Testing and inspecting of completed installations of acoustical panel ceiling hangers shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test

results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

C. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.

1. Within each test area, testing agency will select 1 of every 10 power-actuated fasteners and post installed anchors used to attach hangers to concrete and will test them for 890 N of tension; it will also select one of every 2 post installed anchors used to attach bracing wires to concrete and will test them for 1957 N of tension.

2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Remove and replace acoustical panel ceiling hangers where test results indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 64 00 - WOOD FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes:

1. Scope of Work: Sanding, screening and refinishing existing wood athletic flooring.

B. Related Requirements:

1. Section 09 65 13 “Resilient Base and Accessories” for resilient base installed with wood athletic flooring.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: Test samples of floor to be refinished shall be reviewed with owner’s representative and architect for approval before proceeding with work.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approve such deviations in writing.

2. Subject to compliance with requirements, approved mockups may be part of the completed Work if undisturbed at time of Substantial Completion.

B. Flooring Finish shall comply with Maple Flooring Manufacturing Association (MFMA) grading rules for species, grade, cut and recommended hardwood floor maintenance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver floor assembly materials in unopened cartons or bundles.

B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.

C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

1.7 FIELD CONDITIONS

A. Resurfacing of an existing floor system shall not commence until all masonry, finish and/or wet trades, such as, concrete, painting, etc., plastering/dry walling, tile and overhead mechanical trades are complete. The building must be enclosed and water tight.

B. Permanent heat, light and ventilation shall be installed and operating before, during and after the resurfacing is complete. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.

1.8 WARRANTY

A. Finish floor shall have a warranty for a minimum of eighteen months. Provide a sample of manufacturer's warranty with quote package.

PART 2 - PRODUCTS

2.1 FINISHING MATERIALS

A. Floor-Finish System (WDF-1):

1. Basis-of-Design Product: Defense Waterborne Sport Floor Finish by Advantage Coatings Technologies; www.advantagecoatingstech.com.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 FINISHING PROCEDURES

A. Follow the selected finish manufacturers recommendations.

B. Sand the floor using a minimum of three cuts.

1. Floors with many layers of finish may need additional cuts to remove all excess material.

2. Vacuum and Tack the entire athletic floor system between each cut.

3. The floor may need to be tacked and vacuumed multiple times.

C. Apply coatings per finish manufacturer's recommendations.

D. Abrade the entire surface using a fine grit screen or as recommended by the finish manufacturer.

1. Abrade until the floor is dull and uniform in appearance.

2. Vacuum and Tack the entire athletic floor system.

E. Inspect entire floor to ensure that the surface is acceptable for coating and is completely free from sanding dust.

F. Screen between all coats of finish that are applied or as recommended by the finish manufacturer.

G. Follow selected finish manufacturer's recommendation on time allotted before foot traffic and activities can presume.

3.3 PROTECTION

A. Protect wood athletic flooring during remainder of construction period to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.

1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.

2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

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. Rubber base (RB-#).
2. Rubber molding accessories

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

D. Product Schedule: For resilient base and accessory products.

E. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 MANUFACTURERS

A. Approved manufacturers:

1. Roppe Corp.; www.roppe.com.
2. Stage Step; www.stagestep.com.
3. Johnsonite; www.johnsonite.com.
4. Tarkett; www.commercial.tarkett.com.

2.3 RUBBER BASE, RB-1:

A. Basis-of-Design Product: Pinnacle Rubber Base by Roppe.

B. Group: I (solid, homogeneous).

C. Thickness: 1/8 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Profiles:

1. At Carpet: Straight/ no toe.
2. At Hard Flooring Surfaces: Coved.

G. Color: No. TBD

2.4 RUBBER BASE, RB-2:

A. Basis-of-Design Product: Johnsonite Vent Cove.

B. Height: 4 inches.

C. Lengths: Manufacturer's standard length.

D. Profiles:

1. At Hard Flooring Surfaces: Vented Cove Base.

E. Color: “40 Black”

F. Accessories: Pre-molded corners.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less and 60 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.

4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.

2. Sweep and vacuum horizontal surfaces thoroughly.

3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 09 68 00 - CARPET TILE

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. Carpet tile (CPT-#).

B. Related Requirements:

1. Section 03 54 16 “Gypsum Cement Underlayment” for substrate coordination.
2. Section 09 65 13 “Resilient Base and Accessories” for resilient base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet installation including, but not limited to, the following:
    a. Review delivery, storage, and handling procedures.
    b. Review ambient conditions and ventilation procedures.
    c. Review subfloor preparation procedures.

1.4 SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics and durability.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet installation, showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Carpet type, color, and dye lot.
3. Locations where dye lot changes occur.
4. Seam locations, types, and methods.
5. Type of subfloor.
6. Type of installation.
7. Pattern type, repeat size, location, direction, and starting point.
8. Pile direction.
9. Types, colors, and locations of insets and borders.
10. Types, colors, and locations of edge, transition, and other accessory strips.
11. Transition details to other flooring materials.

C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet: 24-inch-square Sample, or full tile.

2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

D. Product Schedule: For carpet and carpet cushion. Use same designations indicated on Drawings.

E. Qualification Data: For Installer.

F. Product Test Reports: For carpet and carpet cushion, for tests performed by a qualified testing agency.

1. Include verification of compatibility of carpet adhesives with project specific substrates.

G. Sample Warranties: For special warranties.

H. Maintenance Data: For carpet to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

2. Precautions for cleaning materials and methods that could be detrimental to carpet and carpet cushion.

I. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Confirm with Owner prior to purchasing.

1. Carpet: Equal to 5 percent of amount installed for each type indicated. Coordinate with owner’s representative and architect.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Master II certification level.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.

1.7 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet and carpet cushion until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet and carpet cushion over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.8 WARRANTY

A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Failures include, but are not limited to, the following:

a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.

b. Loss of tuft bind strength.

c. Excess static discharge.

d. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

B. Special Warranty for Carpet Cushion: Manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.

1. Warranty includes removal and replacement of carpet and accessories required by replacement of carpet cushion.

2. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse.

3. Failure includes, but is not limited to, permanent indentation or compression.

4. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide carpet materials and adhesives that are compatible with the following substrates:

1. Cast-in-place concrete slabs.

2.2 CARPET

A. Carpet Tile, CPT-1:

1. Basis-of-Design Product: Verticals by Interface, Inc.; www.interface.com

a. Color: No. 104008 “Zenith.”

b. Size: 25cm x 1m.

c. Installation Pattern: Ashlar.

d. Backing: CQuestGB

e. Installation: As selected by architect.

2. Application: As indicated on drawings.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by sound underlayment manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and underlayment manufacturers.

C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI's "CRI Carpet Installation Standard."

D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

E. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints. Comply with requirements specified in Section 09 30 00 “Tiling”.

F. Primer: Provide manufacturer recommended primer for porous substrates where required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.

B. Examine carpet for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate recommended by carpet and underlayment manufacturers.

b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

c. Perform additional moisture tests recommended in writing by adhesive, carpet cushion, and carpet manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "CRI Carpet Installation Standard" and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using

solvents. Use mechanical methods recommended in writing by adhesive, carpet, and underlayment manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 CARPET INSTALLATION

A. Comply with CRI's "CRI Carpet Installation Standard" and carpet and underlayment manufacturers' written installation instructions for the following:

1. Direct-glue-down installation.
2. Double-glue-down installation.
3. Carpet with attached-cushion installation.
4. Preapplied adhesive installation.
5. Stretch-in installation.

B. Comply with carpet manufacturer's written instructions and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

1. Stretch-in Carpet Installation: Install carpet cushion seams at 90-degree angle with carpet seams.

C. Install as indicated on Drawings.

D. Install borders with mitered corner seams.

E. Do not bridge building expansion joints with carpet.

F. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

G. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI's "CRI Carpet Installation Standard."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by carpet manufacturer and underlayment manufacturer and carpet adhesive manufacturer.

END OF SECTION

SECTION 09 78 13 – METAL INTERIOR WALL PANELS

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: Pre-fabricated, installable metal interior wall panel system with related trim and accessories.

1.3 REFERENCES

A. ASTM International (ASTM): ASTM A 240 -Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

B. ASTM International (ASTM): ASTM A 480 - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

C. ASTM International (ASTM): ASTM B36 Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar.

D. ASTM International (ASTM): ASTM E84 - Test Methods for Surface Burning Characteristics of Building Materials.

E. ASTM International (ASTM): ASTM E162 – Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

F. ASTM International (ASTM): ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

G. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA): Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product (panel system as well as face material and other specified components) to be used, including:

1. Preparation instructions and recommendations.
2. Description of materials, finishes, and construction.
3. Storage and handling requirements and recommendations.
4. Maintenance methods.
5. Cleaning methods.

B. Shop Drawings: Submit contractor/installer shop drawings showing plans, sections, and elevations.

C. Samples for Verification: For each finish product specified, two samples, minimum size 3 inches (76 mm) by 4 inches (101 mm) representing actual color, finish, and pattern.

1.5 QUALITY ASSURANCE

A. Sourcing: Provide metal wall panel systems, materials and accessories from a single source.

B. Installer: Minimum 5 years’ experience successfully completing projects of this type and scope is required.

C. Mock-Up: Provide a mock-up for evaluation of application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship and materials are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in accordance with manufacturer's requirements.

B. Store products in manufacturer's unopened packaging with labels intact until ready for installation.

1.7 FIELD CONDITIONS

A. Environmental Requirements: Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Existing Conditions: Field measure to verify dimensions before fabrication.

1.8 WARRANTY

A. Confirm and document manufacturer’s warranty coverage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Rigidized Metals Corporation or approved equal.

2.2 METAL WALL PANEL

A. Basis-of-Design Product: TXTRWall prefabricated interior metal wall panel system with specified face panel, core and backer materials using specified fasteners and accessories.

2.3 PANEL MATERIALS

A. Face Panel: InvariMatte Dull Bead Blast Appearance.

B. Core Material: Medium-Density Fiberboard (MDF) – Fire Rated

2.4 PANEL CONFIGURATIONS

A. Module Size: As indicated on drawings.

B. Face Panel: Pan with 90 degree bent return legs – Welded corners.

C. Core Thickness: Medium- Density Fiberboard (MDF) – 3/4".

2.5 INTERIOR METAL WALL PANEL ACCESSORIES

A. Fastening Systems: Stainless steel Z-clips with Z-rails.

B. Reveals: Butt Joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install interior metal wall panels and accessories plumb, square, and anchored, maintaining uniformed clearances and accurate alignment.

C. Install in accordance with applicable building codes.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Remove temporary protective film promptly upon installation to reduce risk of adhesive residue.

C. Replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 84 33 – SOUND-ABSORBING WALL PANELS

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. Section Includes:

1. Acoustic wall panels (AWP-#).

1.3 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

B. SAA: Sound Absorption Average.

1.4 SUBMITTALS

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

B. Shop Drawings: For unit assembly and installation.

1. Include plans, elevations, sections, and mounting devices and details.

2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.

3. Include details at cutouts and penetrations for other work.

4. Include direction of fabric weave and pattern matching.

C. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets, switches, and thermostats.

2. Items penetrating or covered by units.

3. Show operation of hinged and sliding components covered by or adjacent to units.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of samples of each type, color, pattern, and texture. Submit full-size for most panel types; submit partial panel sample may be submitted for 24 x 24 inches (600 by 600 mm) for larger panels.

E. Product Certificates: For each type of acoustical wall panel, signed by product manufacturer.

F. Qualification Data: For fabricator and testing agency.

G. Product Test Reports: Based on elevation of comprehensive tests performed by a qualified testing agency, for each type of acoustical wall panel.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include manufacturers' written cleaning and stain-removal instructions.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm with commercial experience in manufacturing acoustical wall panels similar to those indicated for this Project and with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the commercial experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

C. Source Limitations for Acoustical Wall Panels: Obtain acoustical wall panels from one source with resources to provide products of consistent quality in appearance and physical properties.

D. Fire-Test-Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical wall panels with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread: 25 or less.

2. Smoke Developed: 450 or less.

E. Installer Qualifications: Engage an experienced installer to perform Work of this Section who has specialized in installing acoustical panels similar to those required for this Project

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical wall panels from excessive moisture when shipping, storing, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet-work, such as concrete and plaster, has been completed and cured to a condition of equilibrium. Protect panel edges from crushing and impact.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Do not install acoustical wall panels until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

C. Maintain minimum 60 F degrees temperature and 35 to 65 percent humidity for 48 hours after installation.

D. Field Measurements: Check actual wall surfaces by accurate field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturers: Kirei; www.kireiusa.com, and 3Form; www.3-form.com.

B. Other approved Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong; www.armstrong.com.

2. Conwed Designscape – Wall Technology, div. of CDC Corp.; subsidiary of Owens Corning; www.conweddesignscape.com.

3. Koroseal Interior Products, LLC; www.koroseal.com.

2.2 ACOUSTIC WALL PANELS, AWP-1

A. Basis-of-Design Product: EchoLine by Kirei.

1. Thickness: 0.47 in.
2. Panel Size: As indicated.
3. Edge Profile: Straight.
4. Color: 633 Pacific.
5. Pattern: Groovy 3.0

B. Installation Method: Direct attach to surface per manufacturer’s recommendation.

2.3 ACOUSTIC WALL PANELS, AWP-2

A. Basis-of-Design Product: Sola Felt Hush Clad Quint by 3Form.

1. Thickness: 3/8 in.
2. Panel Size: As indicated.
3. Color: Armor.

B. Installation Method: Direct attach to surface per manufacturer’s recommendation.

2.4 ACCESSORIES

A. Accessory Components: For each system indicated, provide all accessory, ancillary and other components necessary for complete installation on Project substrates in configuration indicated as work of this Section without limitation at no additional cost to the Project.

2.5 FABRICATION

A. Fabricate panels to sizes and configurations indicated.

B. Fabricate panels to exact sizes required to fit wall surfaces based on field measurements of completed substrates.

C. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

D. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch (1.6 mm) for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.
5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine substrates and structural framing to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.1 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Layout: Measure each ceiling area and establish the layout of panel to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout indicated on reflected ceiling plans in accordance with manufacturer's approved Shop Drawings.

3.2 INSTALLATION

A. General: Install to comply with manufacturer's written instructions.

B. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, and scribe to fit adjoining work accurately at boarders and at penetrations. Comply with panel manufacturer's written instructions for installation of panels using of mounting accessories indicated, or if not indicated, as recommended by manufacturer.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16 inch (1.6 mm) in 48 inches (1200 mm), noncumulative.

B. Variation of Joint Width: Not more than 1/32-inch (0.79-mm) variation from hairline/ reveal line in 48 inches (1200 mm), noncumulative.

3.4 CLEANING AND PROTECTION

A. Clean panels upon completion of installation to remove dust or foreign materials from the fabric, using a dry brush, a vacuum, or both.

B. Maintain conditions in a manner acceptable to the Manufacturer and Installer that ensures that the fabric covered acoustical panels are without damage or deterioration at the time of substantial completion.

C. Replace panels that cannot be cleaned and repaired, in a manner acceptable to the Architect, prior to the time of substantial completion.

END OF SECTION

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field painting of exposed items and surfaces, except as indicated in the Related Requirements articles below.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections. Substrates include:

a. Interior Substrates:

1) Hollow-metal work.

2) Gypsum walls and ceilings.

2. Paint schedule for all finish colors in Project.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Elevator equipment.

b. Finished mechanical and electrical equipment.

c. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.

b. Furred areas.

c. Ceiling plenums.

d. Utility tunnels.

e. Pipe spaces.

f. Duct shafts.

g. Elevator shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.

b. Stainless steel.

c. Chromium plate.

d. Copper and copper alloys.

e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.

b. Linkages.

c. Sensing devices.

d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Products and materials in this Section have been selected for indoor chemical and pollutant source control and/ or low-VOC emitting characteristics.

1.3 DEFINITIONS

A. Volatile Organic Compounds (VOCs): Compounds as defined by the U.S. Environmental Protection Agency (EPA) in 40 CFR § 51.100 (s), (1).

B. Anti-Corrosive Paints: Coatings formulated and recommended for use in preventing the corrosion of ferrous metal substrates.

1.4 SUBMITTALS

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

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.

2. Step coats on Samples to show each coat required for system.

3. Label each coat of each Sample.

4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.5 PROJECT CONDITIONS

A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 7 deg C. Maintain storage containers in a clean condition, free of foreign materials and residue.

B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 10 and 32 deg C.

C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 7 and 35 deg C.

D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 3 deg C above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Volatile Organic Compounds (VOCs): Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available.

2.2 MANUFACTURERS

A. Preferred, Local Manufacturers:

1. Miller Paint; www.millerpaint.com.
2. Rodda paint; www.roddapaint.com.

B. Other Approved Manufacturers:

1. Benjamin Moore & Co.; www.benjaminmoore.com.
2. Flecto (UHDS)
3. PPG Architectural Coatings; corporate.ppg.com.
4. Rust-Oleum; www.rustoleum.com.
5. Sherwin-Williams Company (The); www.sherwin-williams.com.

2.3 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions.

1. The following chemicals shall not be used as an ingredient in any of the paints or coatings applied indoors and on-site:

a. Aromatic Compounds: The product must contain no more than 1.0% by weight of the sum total of aromatic compounds.

b. Halomethanes: Methylene Chloride.

c. Chlorinated Ethanes: 1,1,1-trichloroethane.

d. Aromatic Solvents: Benzene, Toluene (methylbenzene), Ethylbenzene.

e. Chlorinated Ethylenes: Vinyl Chloride.

f. Polynuclear Aromatics: Naphthalene.

g. Chlorobenzenes: 1,2-dichlorobenzene.

h. Phthalate Esters: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate.

i. Miscellaneous Semi-Volatile Organics: Isophorone.Metals and their compounds: Antimony, Cadmium, Hexavalent Chromium, Lead, Mercury.

j. Preservatives (Anti-Fouling Agents): Formaldehyde.

k. Ketones: Methyl ethyl ketone, Methyl isobutyl Ketone.

l. Miscellaneous Volatile Organics: Acrolein, Acrylonitrile.

2. Volatile Organic Compounds: The volatile organic compound (VOC) concentrations (in grams per liter) of the paint or coating shall not exceed those listed below if the paint or coating is applied indoors, on-site. VOCs shall be tested in accordance with the U.S. Environmental Protection Agency (EPA) Test Method 24. The calculation of VOC shall exclude water, exempt solvents, and tinting color added at the point of sale.

a. Flat Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 50 g/L maximum.

b. Non-Flat Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 150 g/L maximum.

c. Gloss Anti-Corrosive Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 250 g/L maximum.

d. Semi-Gloss Anti-Corrosive Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 250 g/L maximum.

e. Flat Anti-Corrosive Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 250 g/L maximum.

f. Bond Breaker Coatings: 350 g/L.

g. Concrete Curing Compounds: 350 g/L.

h. Floor Coatings: 250 g/L.

i. Flow Coatings: 420 g/L.

j. Form Release Compounds: 250 g/L.

k. Pre-Treatment Wash Primers Coatings: 420 g/L.

l. Sanding Sealers (Non-Lacquer): 350 g/L.

m. Shellacs, Clear: 730 g/L.

n. Shellacs, Opaque: 550 g/L.

o. Specialty Primers, Sealers, and Undercoaters: 350 g/L.

p. Stains: 250 g/L.

q. Varnishes: 350 g/L.

r. Waterproofing Sealers: 250 g/L.

s. Waterproofing Sealers, Concrete/Masonry: 400 g/L.

t. Wood Preservatives: 350 g/L.

2.4 PREPARATORY COATS

A. Concrete Unit Masonry Block Filler: High-performance latex block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

B. Interior Primer: Interior latex-based or alkyd primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer.
2. Zinc-Coated Metal Substrates: Galvanized metal primer.
3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.5 INTERIOR FINISH COATS

A. Interior Acrylic Paint: Zero VOC per EPA Method 24; Master Painters Institute (MPI) no. 53.
1. Provide product free of ingredients listed in the Living Building Challenge (LBC) Red List by International Living Future Institute; www.living-future.org.
2. Basis-of-Design Product: No. 536, Ultra Spec 500 Interior Flat Finish by Benjamin Moore.
a. Product's manufacturer provides the following documentation; substitution products without the same documentation will not be considered:
1) Environmental Product Declaration (EPD).
2) Health Product Declaration (HPD).
3) Declare label.
b. Certifications:
1) Cradle-to-Cradle (C2C Silver).
3. Applications: Interior gypsum board ceilings and soffits.

B. Interior Acrylic Paint: Zero VOC per EPA Method 24; Master Painters Institute (MPI) no. 52.
1. Provide product free of ingredients listed in the Living Building Challenge (LBC) Red List by International Living Future Institute; www.living-future.org.
2. Basis-of-Design Product: No. 538, Ultra Spec 500 Interior Eggshell Finish by Benjamin Moore.
a. Product's manufacturer provides the following documentation; substitution products without the same documentation will not be considered:
1) Environmental Product Declaration (EPD).
2) Health Product Declaration (HPD).
3) Declare label.
b. Certifications:
1) Cradle-to-Cradle (C2C Silver).
3. Applications: Interior gypsum board walls.

C. Interior Acrylic Paint: Zero VOC per EPA Method 24; Master Painters Institute (MPI) no. 43.
1. Provide product free of ingredients listed in the Living Building Challenge (LBC) Red List by International Living Future Institute; www.living-future.org.
2. Basis-of-Design Product: No. 539, Ultra Spec 500 Interior Semi-Gloss Finish by Benjamin Moore.
a. Product's manufacturer provides the following documentation; substitution products without the same documentation will not be considered:
1) Environmental Product Declaration (EPD).
2) Health Product Declaration (HPD).
3) Declare label.

b. Certifications:

1) Cradle-to-Cradle (C2C Silver).

3. Applications: Interior doors, door frames, and corner trim.

D. Water-Borne Epoxy System, P#E: Single-component, non-catalyst; low VOC; water cleanup.

1. Primer: As applicable to intermediate coat and topcoat.

2. Intermediate Coat: Epoxy, matching topcoat.

3. Topcoat: Epoxy, eggshell.

a. Basis-of-Design Product: Corotech Pre-Catalyzed Waterborne Wall Epoxy, Eggshell V342 by Benjamin Moore.

4. Application: Gypsum board walls as indicated.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with procedures specified in PDCA P4 for inspection and acceptance of surfaces to be painted.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

C. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.

2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3, SSPC-SP 10/NACE No. 2.

b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

E. Material Preparation:

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

F. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.

3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

4. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

G. Sand lightly between each succeeding enamel or varnish coat.

H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Omit primer over metal surfaces that have been shop primed and touchup painted.

2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.

I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.

K. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

L. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

M. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

N. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

O. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

3.2 CLEANING AND PROTECTING

A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.3 COLOR SCHEDULE

P#	BASIS-OF-COLOR MANUF'R	COLOR	SHEEN
PT-1	Miller Paint	No. 0017 "Luna Moon"	As indicated for substrate and application.
PT-2	Miller Paint	Match Benjamin Moore Color No. HC166 "Kendall Charcoal"	As indicated for substrate and application.
PT-3	Miller Paint	No. 0525 "Marseilles"	As indicated for substrate and application.
PT-4	Miller Paint	Custom; match no. 045-17-1507 (OSU orange)	As indicated for substrate and application.
PT-5	Miller Paint	Custom; match existing facility door frames	As indicated for substrate and application

END OF SECTION

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

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. Fabricated dimensional characters.

B. Related Requirements:

1. Section 09 29 00 “Gypsum Board Assemblies.”

1.3 REFERENCES

A. Signs and their installation shall comply with applicable provisions of the latest edition of the following standards and with requirements of authorities having jurisdiction:

1. ADAAG – Americans with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board.
2. International Code Council/American National Standards Institute A117.1-Standard on Accessible and Usable Buildings Facilities.
3. National Fire Protection Association 101 Life Safety Code.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Signage schedule in manufacturer's format for verification of text/copy.

C. Shop drawings showing materials, construction detail, lay-out, copy, size and mounting method.

D. Full-size sample of each type of dimensional character for verification of materials, color, pattern, overall quality, and for adherence to drawings and requirements indicated.

1.5 QUALIFICATIONS

A. Manufacturer specializing in manufacturing the products specified in this section with minimum five years experience. Obtain signs from one source and a single manufacturer.

1.6 WARRANTY

A. Provide manufacturer’s warranty against defects in materials and workmanship for minimum 5 years.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Acrylic Dimensional Characters:

1. Basis-of-Design Product: Ethos Painted Acrylic by Take Form; www.takeform.net.
2. Character Material: Painted Acrylic Sheet.

3. Material Thickness: 1/4" thick.
4. Character Height: As indicated on Drawings.
5. Character Depth: As indicated on Drawings.
6. Fonts and Styles:
    a. Signage: As selected by Architect.
7. Finishes:
    a. Painted: Satin Silver C0601.
8. Mounting Method: Tape/Stud Flush.

2.2 DIMENSIONAL CHARACTER MATERIALS

A. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.3 ACCESSORIES

A. Adhesive: As recommended by manufacturer.

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

C. Paint: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 44 15 - FIRE PROTECTION CABINETS AND EXTINGUISHERS

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. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

2. Portable fire extinguishers, low profile for fully recessed cabinets.

1.3 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:

a. Schedules and coordination requirements.

1.4 SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.

D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

E. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers required by code are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.6 SEQUENCING

A. Apply decals and lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Electrical Components, Devices, and Accessories: For wired alarms at fire-protection cabinets, listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. NFPA Compliance, Extinguishers: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

D. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

E. Provide fire extinguishers approved, listed, and labeled by FM Global; where required.

F. The Basis-of-Design Product's performance criteria, product properties and attributes, including materials and methods used in fabrication of and/or the manufacturing process of individual components or for entire system, as indicated in manufacturers' current published product literature at the date of the Contract Documents, shall establish the minimum performance requirement for the Project, regardless of inclusion in This Section.

2.2 FIRE-PROTECTION CABINET

A. Approved Manufacturers: JL Industries, a Activar Construction Products Group, Inc.; www.activarcpg.com/jl-industries; Kidde Fire Safety; www.kidde.com.

1. Finish: White, to match Architect's sample.

2. At Extinguisher: Provide model no. 18-LDCVBFE by JL Industries.

B. Pull: Recessed, ADA compliant.

C. Cabinet Construction: Nonrated, except where indicated otherwise.

1. Fire-Rated Cabinets: Provide fire-rated cabinets where located in fire-rated walls, matching wall rating designation. Rated cabinets shall match basis-of-design product indicated. Provide factory-drilled mounting holes.

D. Semi-Recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face.

E. Square-Edge Semi-recessed Trim: 1-1/2 inch flat trim.

F. Door Style: Flush opaque panel, frameless, with no exposed hinges.

G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide recessed door pull and friction latch.

2. Provide continuous hinge, of same material and finish as trim permitting door to open 180 degrees.

H. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2. Door Lock: Cylinder lock, keyed alike to other cabinets, where required by AHJ.

3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated or as directed by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.

2) Application Process: Die-Cut.

3) Lettering Color: Black.

4) Orientation: Vertical.

I. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

a. Finish: Baked enamel or powder coat.

2.3 PORTABLE FIRE EXTINGUISHERS

A. General: Provide shallow profile fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Manufacturers, Shallow Profile Fire Extinguishers:

1. Basis-of-Design Manufacturer: Oval Fire Products Corp.; www.ovalfireproducts.com.

C. Multipurpose Dry-Chemical Type: Industrial grade external cartridge operated multipurpose A-B-C portable dry chemical fire extinguishers in 10 lb. (4.54 kg) size. The extinguishers shall meet or exceed the U.L. ratings.

1. Basis-of-Design Product: Model OFP-ABC90 by Oval Fire Products.

D. Extinguishing Agent: Designed for and rated for use with A-B-C rated multipurpose dry chemical powder; 4A:80B:C rating.

E. Approvals: Extinguishers shall meet or exceed approvals of Underwriters Laboratories (UL) and U.S. Coast Guard.

F. Inspection Capability: With the exception of internal inspection of pressure cartridges, extinguishers shall be designed and constructed to allow complete visual inspection of all internal and external components by disassembly without need for special knowledge or tools.

G. Maintainability: Extinguishers shall be designed to allow field recharging without the requirement for special tools or servicing equipment.

H. Operating Instructions: Complete and concise extinguisher operating instructions shall be clearly displayed in English with visual pictograms illustrating the symbols for Class A, B, and C fire classifications on the front of main canister of the extinguisher. Complete after-use maintenance instructions and agent identifications shall appear on a placard on the rear of the extinguisher in English.

I. Inspection Tag: Provide with each unit.

J. Construction:

1. Main Canister Shell: Corrosion and impact resistant steel and painted with red paint resistant to cracking, chipping, and corrosion in harsh climates. The shell must have a fill port at top with an opening of not less than 6.985 mm (2-3/4 inch) in diameter internally threaded to accommodate a fill cap. The shell exterior shall incorporate a device to secure the discharge nozzle.

2. Pressure Cartridge: The pressure cartridge shall contain a noncombustible gas under pressure in an amount appropriate for the proper discharge of the contents of the main canister. The cartridge shall have a clearly visible (when disassembled from unit) puncture seal to facilitate visual determination of cartridge condition (charged versus discharged). The pressure cartridge shall be designed for installation and removal by hand only without the need for tools. The pressure cartridge shall be provided with “left-hand” threads to prevent inadvertent installation of incorrect cartridges. Each pressure cartridge shall have

the appropriate size designation clearly marked on the body of the cartridge. The pressure cartridge shall be enclosed and by a protective cover attached to the side of the main canister designed for easy removal.

3. Discharge Nozzle: Tempered anodized aluminum construction with access to internal discharge valve without the use of special tools. The nozzle shall be designed to provide “On/Off’” operation with little effort on the part of the operator, and designed and constructed to operate in all environments.

4. Discharge Hose: The discharge hose shall be constructed of long lasting rubber resistant to climatic conditions and retain flexibility to –40 deg. F (-40 deg. C). All couplings shall be of corrosion resistant metal.

5. Carrying Handle: Configuration of the handle shall be such that the angle of the unit while carried is appropriate for proper operation of the unit; stainless steel construction.

6. Actuating Mechanism: The actuating lever shall be designed to require only a single downward pushing action to activate the pressure cartridge; stainless steel construction. All internal working parts of cartridge puncture mechanism shall be of stainless steel.

7. Fill Cap: Corrosive resistant metal and externally threaded to adapt to main canister. The threads shall include machined grooves perpendicular to the threads to provide for release of internal pressure from the main canister during removal while at least two full threads are still fully engaged. The fill cap shall be designed to be installed and removed by hand only without need for tools.

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.

2. Provide factory-drilled mounting holes.

3. Prepare doors and frames to receive locks.

4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.

2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction, but no higher than the following.

1. Fire-Protection Cabinets Installation height: Install at height conforming to NFPA 10.

a. 54 inches above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.

2. Provide inside latch and lock for break-glass panels.

3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 105626.13 – MOBILE STORAGE SHELVING UNITS (LOW-PROFILE MECHANICALLY-ASSISTED BY SPACESAVER)

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:

1. Mechanically assisted, carriage mounted high-density mobile storage units, support rails, fabrication, and installation including leveling of support rails.

B. Related Work, Not Furnished:

1. Structural floor system capable of supporting live and dead loads required by prevailing building codes, including rolling loads of storage units to be installed.

2. Finish floor covering materials and installation on raised floors and ramps or when on concrete with surface-mounted or recessed rail installation.

C. Related Sections:

1. Section 09 68 00 – “Carpet Tile” for floor finish coordination.

1.3 REFERENCES

A. American National Standards Institute (ANSI) Standards:

1. Applicable standards for fasteners used for assembly.

B. American Society for Testing and Materials (ASTM) Standards:

1. Applicable standards for steel materials used for fabrication.

C. American Institute Of Steel Construction (AISC) Standards:

1. Applicable standards for steel materials used for fabrication.

1.4 SYSTEM DESCRIPTION

A. General: The system consists of four-post shelving units mounted on manufacturer’s track-guided carriages to form a compact storage system. System design permits access to any single aisle by manually moving units until the desired aisle is opened. The carriage/rail system provides uniform carriage movement along the total length of travel, even with unbalanced loads.

B. Carriage System Design and Features: The carriage system consists of formed structural steel wheel sections with precision machined wheels riding on steel rails surface mounted to the floor. Wheel sections shall interlock with steel side profiles and shelving posts to form a rigid carriage structure. Wheel sections shall also be interchangeable to permit carriages to be added onto and reconfigured without cutting or welding. Rails shall be types selected by the manufacturer to ensure smooth operation and self-centering of mobile storage units during travel without end play or binding. Rail types, quantities and spacing shall be selected by the manufacturer to suit installation conditions and requirements. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

C. Movement Controls: Triple or single arm operating wheels with rotating hand knobs shall be provided on the accessible (drive) ends of shelf units, centered on the end panel, located 40 inches from the base of each unit to permit units to be moved to create a single aisle opening. Turning the handle transmits power through chain drive to drive wheels on each carriage.

D. Drive System: The system shall be designed with a positive type mechanically-assisted drive which minimizes end play, ensures there is no play in the drive handle, and that carriages will stop without drifting.

1. System shall include a chain sprocket drive system for each movable carriage to ensure that carriages move uniformly along the total length of travel, even with unbalanced loads. All system components shall be selected to ensure a smooth, even movement along the entire carriage length. Drive system gearing shall be designed to permit 1 lb. of force applied to the drive handle to move a minimum of 4,000 lbs. of load.

2. A tensioning device shall be provided on each chain drive with provision for adjusting tension without removing end panels.

3. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

E. Safety Features:

1. Color-coded visual indicators shall provide verification that carriages are in a locked or unlocked mode.

2. A single safety lock button, mounted on each operating wheel hub, will permit moving a carriage in either direction to create a new access aisle when pulled out (unlocked), or locking the carriage when pushed in.

F. Finishes:

1. Fabricated Metal Components And Assemblies: Manufacturer’s standard powder coat paint finish.

2. End Panels, Accessible Ends: Manufacturer’s standard powder coat paint finish.

1.5 PERFORMANCE REQUIREMENTS

A. Design Requirements:

1. Limit overall height to 76 inches.

2. Limit overall length to 8’ 11” inches.

B. Seismic Performance: Provide mobile storage units capable of withstanding the effects of earthquake movement when required by applicable building codes.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of shelving, track and installation accessory required. Include data substantiating that products to be furnished comply with requirements of the contract documents.

B. Shop Drawings: Show fabrication, assembly, and installation details including descriptions of procedures and diagrams. Show complete extent of installation layout including clearances, spacings, and relation to adjacent construction in plan, elevation, and sections. Indicate clear exit and access aisle widths; access to concealed components; assemblies, connections, attachments, reinforcement, and anchorage; and deck details, edge conditions, and extent of finish flooring within area where units are to be installed.

1. Show installation details at non-standard conditions. Furnish floor layouts, technical and installation manuals for every unit shipment with necessary dimensions for rail layout and system configuration at the project site. Include installed weight, load criteria, furnished specialties, and accessories.
2. Provide layout, dimensions, and identification of each unit corresponding to sequence of installation and erection procedures. Specifically include the following:
    a. Location, position and configuration of tracks on all floors.
    b. Plan layouts of positions of carriages, including all required clearances.
    c. Details of shelving, indicating method and configuration of installation in carriages.
3. Provide location and details of anchorage devices to be embedded in or fastened to other construction.
4. Provide installation schedule and complete erection procedures to ensure proper installation.

C. Samples: Provide minimum 3 inch square example of each color and texture on actual substrate for each component to remain exposed after installation.

D. Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts consisting of actual product pieces, showing full range of colors and textures available.

E. Warranty: Submit draft copy of proposed warranty for review by the Architect and Owner.

F. Maintenance Data: Provide in form suitable for inclusion in maintenance manuals for mobile storage units. Data shall include operating and maintenance instructions, parts inventory listing, purchase source listing, emergency instructions, and related information.
1. Submit manufacturer's instructions for proper maintenance materials and procedures.
2. Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against using materials and methods which may be detrimental to finishes and performance.

G. Reference List: Provide a list of recently installed mobile storage units to be visited by owner, architect, and contractor. Intent of list is to aid in verifying the suitability of manufacturer's products and comparison with materials and product specified in this section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage an experienced manufacturer who is ISO 9001 certified for the design, production, installation and service of carriage mounted high-density mobile storage units and support rails. Furnish certificate attesting manufacturer’s ISO 9001 quality system registration.

B. Installer Qualifications: Engage an experienced installer who is a manufacturer's authorized representative for the specified products for installing carriages and anchoring shelving units to carriages.
1. Minimum Qualifications: 2-years experience installing systems of comparable size and complexity to specified project requirements.
2. Guaranteed 24-hour service response time.

1.8 DELIVERY, STORAGE AND HANDLING

A. Follow manufacturer's instructions and recommendations for delivery, storage and handling requirements.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions before fabrication. Indicate verified measurements on Shop Drawings. Coordinate fabrication and delivery to ensure no delay in progress of the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating mobile storage units. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.10 SEQUENCING AND SCHEDULING

A. Sequencing: Coordinate storage shelving system installation with other work to minimize possibility of damage and soiling during remainder of construction period.

B. Scheduling: Plan installation to commence after finishing operations, including painting have been completed.

C. Built-In Items: Provide components which must be built in at a time which causes no delays general progress of the Work.

D. Pre-installation Conference: Schedule and conduct conference on project site to review methods and procedures for installing mobile storage units including, but not limited to, the following:

1. Review project conditions and levelness of flooring and other preparatory work performed under other contracts.
2. Review and verify structural loading limitations.
3. Recommended attendees include:
    a. Owner's Representative.
    b. Prime Contractor or representative.
    c. The Architect.
    d. Manufacturer's representative.
    e. Subcontractors or installers whose work may affect, or be affected by, the work of this section.

1.11 WARRANTY

A. Provide a written warranty, executed by Contractor, Installer, and Manufacturer, agreeing to repair or replace units which fail in materials or workmanship within the established warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have under General Conditions provisions of the Contract Documents.

B. Warrant the entire movable compact shelving installation against defects in materials for five (5) years and workmanship for a period of one (1) year from date of acceptance by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Products are based upon mobile shelving system products manufactured by Spacesaver Corporation.

Spacesaver Specialists, Inc.

Stan Ruiter 503-612-2610

2.2 BASIC MATERIALS

A. General: Provide materials and quality of workmanship which meet or exceed established industry standards for products specified. Material thicknesses/gauges are manufacturer's option unless indicated otherwise.

B. Plastic Laminates: NEMA LD-3, GP-28, Vertical Grade.

2.3 GROUT [WHEN APPLICABLE]

A. General: Provide non-shrink, non-staining hydraulic cement compound conforming to the following requirements, based on the performance of the test specimens at room temperature and in laboratory air.

1. Linear Movement: No shrinkage while setting; maximum expansion limited to .002 inches per linear inch.

2. Compressive Strength: Based on two inch cubes made following ASTM standards, tested on a Balding-Southward machine of 60,000 pounds capacity, meet or exceed the following:

a. Age: 1 hour ---- 4,500 psi
7 days ---- 8,000 psi

2.4 MANUFACTURED COMPONENTS

A. Rails:

1. Material: ASTM/AISI Type 1035 or 1045 steel, or equal, manufacturer's selection.

2. Capacity: 750 pounds per lineal foot of carriage.

3. Minimum Contact Surface: 5/8 inch wide.

4. Rail configuration shall permit attachment to top of structural floor system with provision for leveling rails to compensate for variations in floor surface level.

5. Provide rail connections designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining rail sections. Butt joints are not permitted.

6. Anti-Tip Rail Form Covers: Manufacturer shall provide for protection if required when anti-tip devices are installed.

B. Floor / Ramp [when applicable]:

1. Floor/Ramp Sheathing: Minimum 3/4 inch underlayment grade plywood containing no added urea formaldehyde. Particle board sheathing materials are not permitted.

2. Provide fire retardant treated floor/ramp materials when required by code.

3. Finished flooring materials shall be provided by others.

4. Ramps at entrances to system. Full floor between all rails.

C. Carriages:

1. Provide manufacturer's design movable carriages fabricated of welded wheel assembly with bolted steel and riveted construction. Galvanized carriage components are unacceptable. The use of cross-bracing is unacceptable.

2. Design carriages to allow the shelving uprights to recess and interlock into the carriage wheel section a minimum of 2 inches. Carriage design shall provide a minimum of two shelving retention rivets and two carriage bolts to securely retain each shelving post. Top mounting of shelving onto carriages is unacceptable.

3. Provide each carriage with two wheels per rail.

D. Drive / Guide System:

1. Design: Provide drive system which prevents carriage whipping, binding and excessive wheel/rail wear under normal operation.

a. Provide a full-length line drive shaft, whereby, all wheels on one side of carriage shall drive.

2. Shafts: 1 inch steel connecting tube shafts.

3. Bearing Surfaces: Provide rotating load bearing members with ball or roller bearings. Provide shafts with pillow block or flanged self-aligning type bearings.

E. Wheel Sections:

1. Low-Profile Wheel Section: Minimum 12 ga. fixture-welded wheel sections to ensure that, once installed; bottom storage shelf is no higher than 4.25 inches (108mm) above top of rail. Locate wheel assemblies under each upright to distribute loads directly to wheels.

2. Wheel Size: Minimum 3 inches, outside diameter drive and load wheels.

3. Guide Wheels: All wheels and all locations.

F. Face Panels:

1. Materials: Plastic laminate clad particle board with plastic edging on vertical edges.

2. Finishes: Selected from manufacturer’s standard available colors and patterns.

G. Metal Storage Shelving

1. General: Four-Post Type Metal Shelving.

2. Finishes:

a. Fabricated Metal Components and Assemblies: All components to be painted with an electrostatically applied Powder Coat paint.

b. Fabricated Laminate Components and Assemblies: Manufacturer’s standard low-pressure or high-pressure laminate finishes.

c. Fabricated Non-Porous Solid Surface Components and Assemblies: Manufacturer’s standard.

d. Fabricated Acrylic Components and Assemblies: Manufacturer’s standard.

B. Sizes:

e. Heights of 74.75 inches inches as noted on drawings (variable in 1.5 inch [38.1MM] increments as required).

f. Available in nominal widths of [12] inches to [72 inches] as noted on drawings.

g. Available in nominal single-faced or double-faced depths of [9] inches to [36] inches as noted on drawings.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Provide four-post metal shelving capable of withstanding the effects of earthquake movement when required by applicable building codes.

2.5 FABRICATION

A. General: Coordinate fabrication and delivery to ensure no delay in progress of the Work.

B. Wheels: Provide precision machined units with permanently shielded and lubricated bearings.

C. Carriage Wheel Sections: Fabricate Carriage wheel sections to provide two heavy-duty 7 ga. support plates to support the full weight of shelving posts.

D. Carriage Side Profiles: Fabricate 14 ga. die-formed carriage side profiles 2-3/4 inches tall each with four (4) shelving retention rivets.

E. Rail Shims: Fabricate galvanized steel shims with interlocking tabs to prevent dislocation; interlocking tabs to interlock with rail and with other shims. For non-grouted systems only.

F. Shelving, Supports and Accessories: See individual descriptions in “Shelving” paragraphs.

2.6 FINISHES

A. Colors: Selected from manufacturer’s standard available colors.

B. Paint Finish: Provide factory applied electrostatic powder coat paint. Meet or exceed specifications of the American Library Association.

C. Laminate Finish: Provide factory applied laminate panels at locations indicated on approved shop drawings.

D. Edgings: Provide preformed edging, color-matched to unit colors selected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine floor surfaces with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units.

B. Verify that building structural system is adequate for installing mobile storage units at locations indicated on approved shop drawings.

1. For installations on existing floors, ensure that rail spacings indicated on shop drawings are in proper locations so existing load-bearing structural members are not over stressed.

C. Verify that intended installation locations of mobile storage units will not interfere with nor block established required exit paths or similar means of egress once units are installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to proper performance of mobile storage units, once installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Rails:

1. Lay out rails using full length units to the maximum extent possible. Use cut lengths only at ends to attain total length required. Locate and position properly, following dimensions indicated on approved shop drawings. Verify thickness of finished floor materials to be installed (by others) and install level 1/16 inch above finished floor surfaces.
2. When using grouted rails, verify level, allowing for a minimum 1/4 inch of grout under high points. Position and support rails so that no movement occurs during grouting.
3. When grouting, set rails in full grout bed, completely filling any voids entire length of all rails including rail connectors. Trim up sides flush with rails to ensure proper load transfer from rail to supporting floor. Using shims in lieu of full grouting is not permitted.
4. Installation Tolerances When Grouting: Do not exceed levelness of installed rails listed below:
    a. Maximum Variation From True Level Within Any Module: 3/32 inch.
    b. Maximum Variation Between Adjacent (Parallel) Rails: 1/16 inch, perpendicular to rail direction.
    c. Maximum Variation In Height: 1/32 inch (.8MM), measured along any 10 foot rail length.
5. Installation Tolerances When Shimming: Do not exceed variation from level listed below:
    a. Maximum Variation Across All Rails (up to 5 rails or 12 feet: 3/8 inch.
    b. Maximum Variation from Rail to Rail: 1/8 inch.
    c. Maximum Variation in 12 feet of Rail Length, Along Any Rail: ¼ inch and Maximum Variation in 2 feet of Rail Length (Flatness): 1/8 inch. ~L/600.
6. Verify rail position and level; anchor to structural floor system with anchor type and spacings indicated on approved shop drawings.

B. Floors/Ramps [when applicable]:

1. General: Finished elevation shall be 1/16 inch below top of rails.
2. Place floors and ramps to the extent indicated on approved shop drawings. Provide ramp at both ends of mobile system if dual control access is required.
3. Construct floors and ramps to prevent warping or deformation of floor panels in a normal operating environment. Support panels on levelers at maximum 16 inches on center.
4. Ramp Slope: Do not exceed the following:
    a. ADA Accessible Ramps: Maximum 1:12 slope (4.76 degrees).
    b. Other Ramps: Maximum 9 degree slope (1.9:12).
    c. Vertical Transition, Ramp edge to floor: Maximum 1/8 inch.

C. Shelving Units Installation:

1. General: Follow layout and details shown on approved shop drawings and manufacturer's printed installation instructions. Position units level, plumb; at proper location relative to adjoining units and related work.
2. Carriages:
    a. Place movable carriages on rails. Ensure that all wheels track properly and centering wheels are properly seated on centering rails. Fasten multiple carriage units together to form single movable base where required.
    b. Position fixed carriage units to align with movable units.
3. Shelving Units:
    a. Stabilize shelving units following manufacturer's written instructions. Reinforce shelving units to withstand the stress of movement where required and specified.

3.3 FIELD QUALITY CONTROL

A. Verify shelving unit alignment and plumb after installation. Correct if required following manufacturer’s instructions.

B. Remove components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new matching units, installed as specified and in manner to eliminate evidence of replacement.

3.4 ADJUSTING

A. Adjust components and accessories to provide smoothly operating, visually acceptable installation.

3.5 CLEANING

A. Immediately upon completion of installation, clear components and surfaces. Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

3.6 DEMONSTRATION/TRAINING

A. Schedule and conduct demonstration of installed equipment and features with Owner's personnel.

B. Schedule and conduct maintenance training with Owner's maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform.

3.7 PROTECTION

A. Protect system against damage during remainder of construction period. Advise Owner of additional protection needed to ensure that system will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 11 14 13.19 - TURNSTILES

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. This section covers the furnishing and installation of optical turnstiles..

1.3 REFERENCES

A. ETL listed as per UL325 and UL2593.

B. CSA listed as per CSA C22.2 #247.

C. CE marked in accordance with appropriate European Directives

1.4 SUBMITTALS

A. Submit manufacturer’s descriptive literature for specified equipment, including options.

B. Provide, upon request, site specific drawings and / or installation templates, showing product placement.

C. Provide installation and operation manuals

1.5 QUALITY ASSURANCE

A. Submit manufacturer’s descriptive literature for specified equipment, including options.

B. Provide, upon request, site specific drawings and / or installation templates, showing product placement.

C. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE AND HANDLING.

A. Deliver materials to job site in manufacturer’s packaging undamaged, complete with installation instructions.

B. Store indoors in a controlled environment, protected from weather, construction activities and debris.

C. Use forklift, pallet jack or equivalent equipment for moving

1.7 PROJECT CONDITIONS

A. Install on a level floor.

1.8 WARRANTY

A. Warranty optical products against defects in materials and workmanship for a period of 18 months from the date of invoicing.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: Alvarado Mfg. Co., Inc. 12660 Colony Street, Chino, CA 91710 - USA.

2.2 PRODUCT

A. SU5000 Optical Turnstile with Motorized Swinging Barriers, or approved equal. Include the following options:

1. GateKeeper Control and Monitoring Software.

2.3 CONSTRUCTION

A. Exterior: #304 stainless steel, #4 satin finish.

B. Interior Frame: Black, powder coated steel with openings for conduit.

C. Decorative Lid: Solid surface acrylic; Manufacturer: Livingstone; Color: Starry Night Black.

D. Clear Side Panels and Moving Barriers:

1. Clear Side Panels: 0.5” (13mm) thick cast acrylic having 90% optical clarity and an abrasion resistant coating.

2. Moving Barriers: Two barriers fabricated from 0.5” (13mm) or 0.75” (19mm) thick cast acrylic having 90% optical clarity, pure water white edges and an abrasion resistant coating.

2.4 DIMENSIONS

(NOTE TO SPECIFIER: Select desired passage opening dimensions and barrier heights)

A. Passage Opening:

1. Special Needs: 36” (914mm)

B. Left and Right End Cabinets:

1. Length: 52” (1321mm)

2. Height: 41” (1041mm)

3. Width nominal 3.8” (96.5mm)

4. Width maximum: 5.3” (135mm)

C. Center Expansion Cabinets:

1. Length: 52” (1321mm)

2. Height: 41” (1041mm)

3. Width nominal 3.8” (96.5mm)

4. Width maximum: 6.8” (173mm)

D. Moving Barrier Heights:

1. Med: 46” (1168mm)

2.5 EQUIPMENT

A. Types of Units: The installation shall consist of end and center lanes, as required by the installation. Center cabinets shall have the same height, length and nominal width dimensions as end cabinets. Units shall be bi-directional in operation.

B. Passage Modes:

1. Controlled Passage: Each patron must present a valid electronic credential to the integrated reader before passage is allowed. Upon receipt of an authorization signal from the access control system, the barriers open and allow a single passage in the authorized direction. The barriers return to the closed position after the user has passed through the turnstile or the time frame allowed for entry expires. The turnstile will buffer multiple inputs to maximize throughput.

2. Free Passage: All patrons are allowed to pass. The barriers open when the first sensor in the cabinet array is activated and close when the patron passes through the turnstile.

3. No Passage (Direction Closed): No passage is allowed. Valid electronic credentials are ignored.

4. Visitor: Allows visitors and groups without credentials access through the turnstile. When placed in Visitor Mode, the barriers open and remain open. Passages in either direction are monitored and an output is provided for each passage.

C. Operating Modes:

1. Normally Closed: The barriers are closed, securing the turnstile.

2. Barrier Disabled: The barriers remain open, allowing the unit to function as a barrier free optical turnstile.

3. Emergency: Activation to open the barriers in conjunction with a fire alarm or similar system. When activated, the barriers open in the exit direction and remain open until deactivated.

4. Power Failure: In the event of loss of power, the barriers can be feely moved in either direction. When pushed or pulled to the open position the barriers remain open.

D. Optical Detection:

1. Strategically placed optical sensors and a sophisticated detection algorithm detects patrons, determines the direction of patron movement, and (in conjunction with the facility access control system) detects unauthorized users.

2. Each sensor to consist of a separate transmitter and receiver operating on a high-speed communication bus.

3. The sensors and system:

a. Must have the capability of tracking a user’s passage from entry to exit point

b. Must consistently detect closely following tailgaters on allowed entries while avoiding generating false alarms for commonly carried objects

c. Must detect patrons travelling in the opposite direction when passage has been allowed

4. Sensitivity settings to be adjustable via an included configuration utility.

5. Sensor operation shall not be affected by natural or indoor lighting.

6. Sensors to be deployed at various heights to detect persons crawling through the passage area.

7. Safety sensors shall be present to prevent the barriers from closing or opening when persons or objects are the barrier field of travel.
8. The optical system to provide superior processing speed and throughput of up to one person per second, subject to the access control system limitations.

E. Motor and Motor Control:

1. Barrier movement must be:
   a. Accomplished via brushless DC motor / planetary gearbox combination utilizing digital position closed loop motor control.
   b. Smooth and controlled for all sized barriers; no shimmying or wobbling during opening or closing.
   c. Self-aligning so that barriers always align in the home or closed position.
2. Barriers to detect impact with an object or obstruction during the opening or closing cycle so as to minimize impact with a person, object or obstruction.
3. Unit to have an integrated electromechanical lock which secures the barriers against forced entry in the home or closed position.

F. System Integration:

1. Units shall integrate with third-party access control systems through the use of dry contact inputs and outputs.
2. Custom methods of integration (through TCP commands) shall be available.
3. Available Inputs: Available inputs shall include:
   a. Passage allowed, access granted x 2
   b. Passage denied, access denied x 2
   c. Direction closed, no passage x 2
   d. Direction open, free passage x 2
   e. Visitor allowed, access granted x 2
   f. Single override entry x 2
   g. Disable barrier x 1
   h. Emergency override x 1
   i. TCP port
4. Available Outputs: Available outputs shall include:
   a. Authorized passage x 2
   b. Unauthorized passage x 2
   c. Unauthorized presence x 2
   d. Free passage x 2
   e. Sensor blocked x 1
   f. Barrier held open x 1
   g. Barrier breakaway x 1
5. Configuration Capabilities: Units shall come with Alvarado's LaneConfig, which is a web-based utility that allows the installer to conveniently configure settings for installed turnstiles. The utility must allow dissemination of operational settings for a single unit, or

all installed units, over an Ethernet network. Configurable unit features available from the web-based utility to include:

a. User definable operational and alarm sounds

b. Access timeout configuration

c. Object size and tailgating sensitivity

d. Unauthorized entry sensor control

e. Electromechanical brake use and barrier breakaway force

f. Barrier impact force

g. Blocked sensor time

h. Alarm duration

i. Emergency override barrier movement direction

6. Diagnostic Capabilities: The web-based utility shall also provide the following diagnostic capabilities:

a. Operational debug

b. Optic debug

c. Motor I/O debug

7. Power: Power requirements are as follows:

a. 110/220 VAC run to main controller cabinet; power stepped down to 24/12/5VDC for operation.

b. Power / digital signals run between cabinets via a conduit run interconnect cable.

G. User Interface:

1. Enter / Exit User Status Display: The unit to have LED illuminated user status icons visible looking down on the lid, on each side of the unit. User status icons to be as follows:

a. An illuminated yellow means the turnstile is ready for card presentation.

b. An illuminated green means valid credentials have been presented and / or passage is allowed in the direction of the arrow.

c. An illuminated red X symbol means that passage is prohibited in the direction of the arrow.

d. A flashing red stop X symbol means invalid credentials have been presented or the turnstile has an alarm condition.

2. Open / Closed Status Lights: The unit to have an opaque end piece mounted to the upper end “leg” of each side of the turnstile diffusing green and red signal LED’s. The lights to function as follows:

a. Green consistently illuminated means the turnstile is open for use.

b. Red consistently illuminated shall signify the turnstile is closed for use.

c. A flashing red shall signify an alarm condition.

d. The timing and length of illumination shall be user definable for select alarms.

3. User Definable Sounds: Each unit shall allow user to define the duration and type of audible sounds (in the form of .wav files) that play for the following alarms and operations.

a. Access accepted

b. Access denied

c. Unauthorized presence

d. Unauthorized passage

e. Blocked sensor

f. Unsafe to open / close barrier

g. Barrier breakaway

h. Barrier impact

i. Barrier lingering

j. Appropriate startup

H. Operator Interface for Control:

1. Control Software: Alvarado's GateKeeper web-based control and monitoring software shall be provided. Communication between the control software and the units shall be TCP/IP.

2. Features of Control Software: The software shall include or provide:

a. Three different levels of access, with the level of access dependent on the level of the operator. Access levels shall be password protected.

b. Real time status of installed units.

c. Change of operational status modes in real time.

d. Monitoring of alarm conditions and screen alerts showing alarm conditions.

e. Ability to place individual or all units in emergency override condition.

f. Ability to allow a single passage through an individual lane in either direction.

g. Apply settings/changes to one or all units.

3. Event Scheduler: An integrated event scheduler allowing modes and access direction settings to be changed automatically at scheduled times.

4. Reporting: A detailed log of all activity for defined periods

2.6 SECURITY EQUIPMENT

A. Reader Integration:

1. Mullion sized proximity readers can be installed under the turnstile lid.

2. Readers can be installed on the turnstile lid subject to space limitations.

3. Other options are available (see Options section below).

4. Readers can be factory installed, or installed in field by installer.

5. Readers and installation are not part of the product and must be purchased separately from Alvarado.

2.7 OPTIONS

A. Adjustable Reader Mounting Attachment: An adjustable reader mounting attachment, which accommodates additional and / or larger size readers, can be installed on either side of the turnstile. The attachment to allow orientation of the reader angle to suit individual installation requirements.

B. 220VAC: 220VAC, 50 Hz power supply and EU wiring scheme.

C. Barcode Imager: A 1D / 2D bar code imager can be recessed into the right-hand leg on either side of the turnstile. Typically used for scanning of visitor cards.

D. Baseplates: Baseplate for either a single turnstile or multi-turnstile configurations. Powder coated black with a sprayed non-slip coating in walkway area. Baseplate houses interconnection cable.

E. Side Panel Illumination (Dynamic): Select panels dynamically change color based on presented card status and alarm conditions.

F. Monitoring and Operational Mode Scheduling Software (GateKeeper): Web-based communication and control software.

G. Turnstile Key Controls: 3-position key switches installed in turnstile cabinet provide quick method of placing the turnstile direction in Controlled Passage, Free Passage or No Passage mode.

H. Automatic Barrier Opening on Loss of Power: An enclosure houses the turnstile UL listed power supply and power buffer. On loss of power, the power buffer retains power to automatically open the barriers in the exit direction.

2.8 FACTORY TESTING

A. Product shall be fully assembled at the factory.

B. Check all mechanical connections.

C. Check all electrical connections.

D. Provide 24-hr factory burn in testing.

E. Inspect product finish. Touch up prior to packaging.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspection: Installer must examine the installation location and advise the Contractor of any site conditions inconsistent with proper installation of the product. Installation shall not begin until unacceptable conditions are rectified. These conditions include but are not limited to the following:

1. Floor must be level within the footprint of the turnstile.

2. Primary power must be installed prior to turnstile installation.

3. Power and communication wiring to come from the floor through conduit stub up locations per manufacturer directions, or via alternate methods if manufacturer is contacted and approves.

B. Installation: Install turnstiles in accordance with manufacturer instructions. Installer to be factory trained or a factory representative shall be present to oversee installation.

C. Adjustment: Installer shall adjust turnstiles for proper performance after installation.

D. Instruction: A factory trained installer shall demonstrate to the owner’s maintenance crew, or designated representative, the proper operation and the necessary service requirements of the equipment.

E. Cleaning: Clean metal, acrylic and optic surfaces carefully after installation to remove excess caulk, dirt and labels following the manufacturer directions.

F. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

END OF SECTION

SECTION 12 22 00 - CURTAINS AND DRAPES

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 draperies and drapery tracks.

B. Related Requirements:

1. Section 09 29 00 "Gypsum Board" for coordination with drapery track.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Tracks: Include maximum weights of draperies that can be supported.
2. Fabrics

B. Shop Drawings:

1. Tracks: Show installation and anchorage details and locations of controls.
2. Draperies: Show sizes, locations, and details of installation.

C. Samples: For each drapery fabric and for each color and texture specified, 10 by 8 inches (250 by 200 mm) in size.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each fabric treated with flame retardant, signed by fabric supplier and indicating treatment durability and cleaning procedures required to maintain treatment effectiveness.

1.5 CLOSEOUT SUBMITTAL

A. Maintenance Data: For products to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: For draperies and tracks, fabricator of draperies.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before drapery fabrication, and indicate measurements on Shop Drawings.

B. Scheduling: Do not deliver or install draperies until after other finish work, including painting, is complete and spaces are otherwise ready for occupancy.

PART 2 - PRODUCTS

2.1 DRAPERY TRACKS

A. Manually Operated Track <CURTAIN TRACK>.

1. Basis-of-Design Manually Operated Track:
   a. Manufacturer: Kirsh.
   b. Hand Draw Cordless System.
   c. Track: 94003.

2. Construction: Extruded aluminum.
   a. Lengths and Configurations: As indicated on Drawings.
   b. Support Capability: 30 lb (14 kg) mounted on track length indicated.
   c. Finish: White baked enamel.

3. Mounting Brackets: Aluminum, of type suitable for fastening track to surface indicated and designed to support weight of track assembly and drapery plus force applied to operate track.
   a. Mounting Surface: As indicated on Drawings.
   b. Size: As indicated on drawings.

4. Installation Fasteners: Sized to support track assembly and drapery, and fabricated from metal compatible with track, brackets, and supporting construction. Provide two fasteners to fasten each bracket to supporting construction.

5. Operation: Hand Drawn.
   a. Draw: One way, stack as indicated on Drawings.

6. Carriers: Coordinate with drapery headings indicated.
   a. Master Carriers: Butt.

7. End Stops: Manufacturer's standard.

8. Pulleys: Standard duty.

2.2 DRAPERIES

A. Basis-of-Design Drapery: Window Covering by Maharam; www.maharam.com
   1. Series: Ballast
   2. Style: 283814
   3. Color: 007 Rainwash

B. Source Limitations: Obtain each color and pattern of drapery fabric and trim from one dye lot.

2.3 DRAPERY FABRICATION

A. Fabricate draperies in heading styles and fullnesses indicated. Fabricate headings to stand erect. If less than a full width of fabric is required to produce panel of specified fullness, use equal widths of not less than one-half width of fabric located at ends of panel.

   1. One-Way-Stacking Draperies: Add 5 inches (127 mm) to overall width for returns.

B. Seams: Sew vertical seams with twin-needle sewing machine with selvage trimmed and overlocked. Join widths so that patterns match and vertical seams lay flat and straight without puckering. Horizontal seams are not acceptable.

C. Side Hems: Double-turned, 1-1/2-inch- (38-mm-) wide hems consisting of three layers of fabric, and blindstitched so that stitches are not visible on face of drapery.

D. Bottom Hems: Double-turned, 4-inch- (102-mm-) wide hems consisting of three layers of fabric, and weighted and blindstitched so that weights and stitches are not visible on face of drapery.

1. Sew in square lead weights at each seam and at panel corners.

PART 3 - EXECUTION

3.1 DRAPERY TRACK INSTALLATION

A. Install track systems according to manufacturer's written instructions, level and plumb, and at height and location in relation to adjoining openings as indicated on Drawings.

B. Isolate metal parts of tracks and brackets from concrete, masonry, and mortar to prevent galvanic action. Use tape or another method recommended in writing by track manufacturer.

3.2 DRAPERY INSTALLATION

A. Where draperies abut overhead construction, hang draperies so that clearance between headings and overhead construction is 1/4 inch (6.4 mm).

B. Where draperies extend to floor, install so that bottom hems clear finished floor by not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm).

3.3 ADJUSTING

A. After hanging draperies, test and adjust each track to produce unencumbered, smooth operation.

B. Steam and dress down draperies as required to produce crease- and wrinkle-free installation.

C. Remove and replace draperies that are stained or soiled.

END OF SECTION 122200

SECTION 124816 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes recessed metal floor grilles and frames (EFG-1).

B. Related Requirements:

1. Section 018113 “Sustainability Requirements”.

1.2 COORDINATION

A. Coordinate size and location of recesses in concrete to receive floor grilles and frames.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for entrance floor grilles and foot grilles.

B. Shop Drawings:

1. Items penetrating floor grilles and frames, including door control devices.
2. Divisions between grille sections.
3. Perimeter floor moldings.

C. Samples: For the following products, in manufacturer's standard sizes:

1. Floor Grille: Assembled section of floor grille.
2. Frame Members: Sample of each type and color.

D. Maintenance Data: For floor grilles and frames to include in maintenance manuals.

1.4 FIELD CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer, EFG-1:

1. Construction Specialties (C/S) Group; www.c-sgroup.com.

2.2 ENTRANCE FLOOR GRILLES, GENERAL

A. Structural Performance: Provide floor grilles and frames capable of withstanding the following loads and stresses:

1. Uniform floor load of 300 lbf/sq. ft. (14.36 kN/sq. m).
2. Wheel load of 400 lb (181 kg) per wheel.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

2.3 FLOOR GRILLES

A. General: Provide manufacturer's standard floor-grille assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.

B. Aluminum Floor Grilles, EFG-1: Provide manufacturer's standard floor grilles with extruded members, top-surfaced tread rails, and as follows:

1. Basis-of-Design Product, EFG-1: Construction Specialties (C/S) Group Pedigrid G1.

2. Tread Rails: Extruded-aluminum tread rails.

a. Aluminum Color: Mill.

3. Tread Rail Spacing: 1-1/2 inches (38 mm) o.c. with 1/8- to 3/16-inch- (3.2- to 4.8-mm-) wide openings between treads.

4. Top Surface: Fusion-bonded, level-cut-pile nylon carpet insert; 1/4 inch (6.4 mm) high, 28 oz./sq. yd. (950 g/sq. m).

a. Top Surface Color: Exterior Carpet, as selected by Architect from manufacturer's full range.

5. Grille Size: Match existing.

6. Lockdown: Manufacturer's standard.

2.4 FRAMES

A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.

2.5 MATERIALS

A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15.

C. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6061-T6 or Alloy 6063-T5, T6, or T52 as standard with manufacturer. Coat surface of frame in contact with cementitious materials with manufacturer's standard protective coating.

D. Stainless-Steel Angles: ASTM A 276 or ASTM A 479/A 479M, corrosion resistant, Type 304.

2.6 FABRICATION

A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.7 ALUMINUM FINISHES

A. Mill finish.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

C. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

2.8 STAINLESS-STEEL FINISHES

A. Mill finish.

B. Directional Satin Finish: No. 4.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of floor grilles and frames.

B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before floor grille and frame and drain pan installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed floor grilles and frames and drain pans to comply with manufacturer's written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

3.3 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124816

SECTION 13 42 75 – INTEGRATED INTERIOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A . Section Includes:

1. Delegated design of integrated interior assemblies.
2. Structure.
3. Finish panels.
4. Doors and frames.
5. Door hardware.
6. Electrical.
7. Communications.
8. Factory integrated components.
9. Site integrated components.

B . Related Requirements:

1. 08 71 00 - Door Hardware for site integrated components.
2. 08 80 00 – Glazing for integration of glazing.
3. 09 51 23 - Acoustical Tile Ceilings for site integrated components.
4. 09 65 13 - Resilient Flooring for site installed integral cove base at interior assemblies.
5. Division 26 - Electrical for site integrated components and commissioning.
6. Division 27 - Communications for site integrated horizontal cabling.
7. Division 28 - Electronic Safety and Security for site integrated components.
8. OSU Construction Standards.

1.2 DEFINITIONS

A . Finish Panel: Site installed panels with factory applied final finish and cutouts for accommodation of mechanical, electrical and plumbing components.

B . Conventional back box: Standard NEC device metallic back box.

C . Modular back box: Manufacturers standard NEC device metallic back box.

D . Specialty back box: Proprietary back box required for devices other than those specified in this section.

E . Modular trim rings: Manufacturers standard plastic trim rings.

F . Factory Integrated Components: Materials or components specified in other sections for factory assembly within integrated interior assemblies.

G . Site Integrated Components: Materials or components specified in other sections for site assembly within integrated interior assemblies.

1.3 SUBMITTALS

A . Submit the following in accordance with section 01 33 00 Submittal Procedures.

B . Submittals must be reviewed and approved by the Contractor before sending to the Architect for review.

C . Sample: Submit two samples for verification of selected finish as scheduled upon request unless noted otherwise. All wood veneer and non-standard custom finishes must be reviewed and approved by the Architect.

1. Anodized: 3 x 6 inch (76mm x 153mm) on metal.
2. Chroma coat:
   a. Standard Color: 2 x 2 inch (51mm x 51mm) paint chip.
   b. Custom Color: 4 x 6 (102mm x 153mm) inch on MDF.
3. Powder Coat: 2 x 4 inch (51mm x 102mm) on metal.
4. Glass: 4 x 4 inch (102mm x 102mm).
5. Wood Veneer: 4 x 4 inch (102mm x 102mm) on MDF.
6. WriteAway Laminate: 4 x 8 inch (102mm x 203mm).

D . Product Data: Provide manufacturers standard tech sheets as applicable to the project for the following: Structure, Finish Panels, Doors and Frames, Door Hardware, Electrical, Communications, and Accessories.

E . Pre-Manufacture Submittals: Provide the following information to the manufacturer prior to development of shop drawings.

1. Field measurements of existing construction, future construction, finished width and height of walls and associated components, as well as design team provided plans and elevations.
   a. Where field measurements are not possible, hold-to and control dimensions must be coordinated and agreed upon by all parties who interface with the integrated interior assemblies through the Shop Drawing process before manufacturing begins.
2. Structure: Include selected wall types.
3. Finish Panels: Include finishes and configurations.
4. Doors and Frames: Include cores, finishes, frames, and operations.
5. Door Hardware: Include manufacturers standard hardware and site integrated component hardware.
   a. One sample of each type of Site Integrated Door Hardware that is to be installed in doors included in this section shall be sent to manufacturer for review and approval.
6. Electrical: Include device type and location, schedules indicating electrical device specifications, amperage, ground pin orientation, type of solution, wiring configuration, receptacle, faceplate and trim ring colors and styles, and any Factory or Site Integrated Components.
7. Communications: Include product data, fabrication drawings and schematics for any Factory or Site Integrated Components.

8. Factory Integrated Components: Provide make, model, size, configuration, materials and any additional pertinent product data for factory assembly.

9. Site Integrated Components: Provide make, model, size, configuration and any additional pertinent product data for site installation.

F . Shop Drawings: Submit shop drawings for review prior to commencing any fabrication of the integrated interior assemblies. Coordinate as required until scope is confirmed by all affected stakeholders. Include manufacturer provided plans, elevations, sections, schedules and applicable notes per the following:

1. Prior to shop drawing submittal review the drawings for obvious drafting and detailing errors.

2. Indicate material descriptions, dimensions and profiles of adjacent components and assemblies interfacing with the integrated interior assemblies.

3. Indicate field measurements of existing construction, future construction, finished width and height of assemblies and associated components.

4. Structure: Indicate reveal type, profile type, finishes and attachment to base building.

5. Finish Panels: Indicate finishes, cores, glazing, accessories and configurations.

6. Doors, Frames and Hardware: Include elevations indicating glazing and finishes, schedules indicating door tags, styles, dimensions, handing, hardware and finishes.

7. Electrical:

   a. Coordinate electrical components specified herein with the documents provided by the electrical engineer of record.

   b. Indicate types and locations of wiring devices, outlet, junction and pull boxes, copper conductors and cables, conduit, electrical branch circuiting, amperage, ground pin orientation, wiring diagrams, and faceplate, receptacle and trim ring colors and styles.

8. Plumbing Accommodation: Indicate location of chase posts, sink mounting brackets and blocking, and provisions for plumbing fixture carriers.

9. Communications: Indicate device type and location of components within the integrated interior assembly. See division 27 for additional submittal requirements.

10. Factory and Site Integrated Components: Indicate device type and location.

G . Delegated Design Submittals: Provide structural analysis data and calculations for installed products to demonstrate compliance with design loads, signed and sealed by licensed professional engineer registered in the jurisdiction of the project.

1. Include engineering calculations for grid connections, bulkhead connections, and seismic conditions.

H . Manufacturer's Installation Instructions: Indicate any special preparation of base building conditions, installation and attachment methods.

I . Qualification Statements.

J . Operation and Maintenance Data: Provide maintenance data for incorporation into operation and maintenance manuals.

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

L . Closeout Submittals: Submit copy of packing slip for shipment of re-usable packaging "cookies" and modular electrical dust caps back to manufacturer.

M . Installer Performed Testing: Submit documentation of installer performed tests and certification for submission to the Authority Having Jurisdiction.

1.4 QUALITY ASSURANCE

A . Qualifications:

1. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section, of the quality and complexity required for this project for a minimum 10 years. Show production facilities capable of meeting contract requirements for single-source responsibilities and warranty.

2. Designer Qualifications: Professional structural engineer with 3 years of documented experience in design of this work and licensed in the location of the project.

3. Wall Installer Qualifications: Company trained and certified by manufacturer and specializing in performing the work of this section.

4. Electrical Installer Qualifications: Installer licensed for the work in the location of the project with 3 years of documented experience.

5. Integrated Electrical Components Installer Qualifications: Connections to the base building electrical system and all field installed electrical components, devices, and accessories require installation by an electrical contractor licensed in the jurisdiction of the project in accordance with applicable building and electrical codes and standards. Such work shall be performed under permit, tested, and inspected to confirm adequacy of final installations to the satisfaction of the Authority Having Jurisdiction.

B . Source Limitations: Obtain integrated interior assemblies from a single source.

1.5 DELIVERY, STORAGE, AND HANDLING

A . Do not deliver or install integrated interior assemblies until spaces are enclosed and weather-tight, wet work is complete and dry, work above ceilings is substantially complete, and HVAC system is operational and able to maintain ambient temperature and humidity conditions between 60 and 90 degrees F (15.5 and 32.2 C) with Relative Humidity maintained between 25 and 55 percent.

B . Do not allow packaging to get wet or develop condensation.

C . Comply with the manufacturer’s requirements for a warrantable installation of the installed products to meet the Performance and Design Criteria.

D . Collect and return re-usable packaging "cookies" and modular electrical dust caps to manufacturer.

E . Comply with SMACNA (OCC) Chapter 3 and Section 01 57 22 Construction Indoor Air Quality.

1.6 WARRANTY

A . Manufacturer Warranty: Provide 10 year warranty on walls, doors, door frames, door hardware, electrical, and communications for failures in materials or workmanship as indicated by the manufacturer standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A . Basis of Design Manufacturer: DIRTT Environmental Solutions or approved equal.

B . Specification is based on products listed below by DIRTT Environmental Solutions.

2.2 DESCRIPTION

A . Factory assembled, site installed, integrated interior assemblies, including Structure, Finish Panels, Doors and Frames, Door Hardware, Electrical, Communications, and Factory and Site Integrated components.

2.3 PERFORMANCE AND DESIGN CRITERIA

A . Provide integrated interior assemblies that are factory sub-assembled and site installed to integrate with the base building structure, shell, mechanical, electrical and plumbing systems.

B . Walls shall utilize factory finish site installed panels that mechanically fasten to a factory finished and assembled aluminum structural frame module. Finish panels may be monolithic or segmented with the ability to span off-module, or across multiple frames in segments or monoliths, vertically and horizontally.

C . Assembly shall allow for independent configuration of structure, finishes and functions relative to each side of the wall.

D . Assembly shall be comprised of components which can be disassembled, relocated and field cut and substantially reused for future reconfigurations allowing for adaptability and retrofitting of the Structure, Finish panels, Doors and Frames, Door Hardware, Electrical, Communications, and Factory and Site Integrated components.

E . Structure shall be capable of supporting wall hung accessories including but not limited to: casework, furniture, systems furniture, shelves, countertops and equipment in channels or reveals that are integrated within the structural frame and enable universal horizontal alignment without damaging finishes.

F . Integrated interior assembly shall provide accommodation or provision for the embedding (fully encased behind glass) of electronics in the wall cavity. Structural framing shall allow for universal non-standard AV display, sound, and various support equipment to be mounted in the cavity of the wall with all required structural brackets, wire management, access and ventilation equipment to prevent overheating.

G . Integrated interior assembly shall enable access of the internal cavity from either side without the addition of an access panel or need for repairing of finishes.

H . Provide integrated interior assembly with a continuous open cavity vertically and horizontally free of structural impediments for the routing of mechanical, electrical and plumbing components.

I . Provide integrated interior assemblies capable of accommodating up to a 1-inch (25 mm) gap between the top, bottom and side edges of the prefabricated assembly and base building elements.

J . Provide an integrated interior assembly system capable of accepting pressure fit extrusions and co-extrusions to fill voids between finish panels, at ceiling connections, and other base building connections.

K . Structural Performance:

1. Capable of withstanding the effects of gravity loads, dead loads, and the following loads and stresses within limits and under conditions indicated:
    a. Transverse Load: Lateral deflection of the overall span when tested under a uniformly distributed load of 5 psf (0.24 kN/m2) in accordance with ASTM E72 where (L) equals wall height:
        a. Solid Walls: not more than L/120
        b. Glass Walls: not more than L/175 or 3/4 inch (19 mm) whichever is more stringent.
    b. Mechanical Strength: Capable of withstanding static loads in accordance with ANSI/BIFMA X5.6.
    c. Seismic Performance: Provide integrated interior assemblies capable of withstanding effects of seismic motions determined according to the Authority Having Jurisdiction.

L . Acoustic Attenuation:

1. Sound Transmission Class (STC) rating of integrated interior assemblies shall be calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
2. Interior Walls Indicated as Acoustic: Provide completed assemblies with the following characteristics:
    a. Four inch (102mm) solid wall: 40-45 STC.
    b. Four inch (102mm) single glazed wall: 30-35 STC.

M . Fire Resistance:

1. Surface-Burning Characteristics:
    a. Finish materials shall be tested in accordance with ASTM E84 and NFPA 286 as required by 2018 IBC 803.1.1.
2. Integrated Interior Assembly shall be approved for use by a qualified independent testing agency in Types I and II Construction in accordance with 2018 IBC section 603.1 (2) and 603.1 (7).

N . Assembly UL Ratings:

1. UL 723; Standard for Test for Surface Burning Characteristics of Building Materials

2.4 STRUCTURE

A . Two sided wall: Fully assembled non-bearing structural frame module with site installed finish panels on both sides.

1. Reveal Type and Size: As selected by architect.
2. Material: Aluminum extrusions, 6063-T6 aluminum alloy classified as noncombustible in accordance with ASTM E136 per 2018 IBC 703.5.1.
    a. Thickness: As required to meet performance requirements.
3. Wall Thickness: Actual 4 inch (102mm).
    a. Bracing: as required to meet structural performance requirements
4. Bottom Track: Integral with modular frames.

a. Provide frame bases with continuous adjustment mechanism for 1-1/2 inch (38mm) height adjustment to accommodate floor slab variances.

5. Vertical Element Spacing: As required to meet performance requirements within a minimum of 6 inches (152mm) and a maximum of 48 inches (1219mm).
6. Blocking Bracket: Factory mounted **[4 inch (102mm)]** and **[6 inch (152mm)]** concealed structural blocking fabricated of 12 gauge or 16 gauge galvanized steel in a horizontal or vertical orientation between aluminum extrusions for wall mounted components.
7. Provide cutouts and support brackets as required for plumbing, electrical and communication pass through from frame to frame.
8. Insulation: UltraTouch Recycled Denim treated with boric acid classified in accordance with ASTM E84 per 2018 IBC 603.1(2).

B . Glazed wall: Fully assembled non-bearing structural frame module with glass infill and Site assembled non-bearing structural frame module with glass infill.

1. Reveal Type and Size: As selected by architect.
2. Material: Aluminum extrusions, 6063-T6 aluminum alloy classified as noncombustible in accordance with ASTM E136 per 2018 IBC 703.5.1.
    a. Thickness: As required to meet performance requirements.
3. Wall Thickness: Actual 4 inch (102mm).
    a. Bracing: as required to meet structural performance requirements
4. Bottom Track: Integral with modular frames.
    a. Provide frame bases with continuous adjustment mechanism for 1-1/2 inch (38mm) height adjustment to accommodate floor slab variances.
    b. Accessories: seismic floor anchor attachment.
5. Vertical Element Spacing: As required to meet performance requirements within a minimum of 6 inches (152mm) and a maximum of 60 inches (1524mm).
    a. Vertical Element spacing may exceed 60 inches (1524mm) with manufacturer review and approval.
6. Glazing Finish Panel: Per glazing specifications.
7. Glazing Gasket Color: As selected by architect.

C . Structure Exposed Finishes:

1. Clear Anodized Aluminum: AAMA 611, AAM12C22A31, Class I
2. Powder coat:
    a. Finish: Per Finish Schedule below.
3. Wood Veneer: Natural wood laminated to structure.
    a. Species: Per Finish Schedule below.
    b. Grade: 1.
    c. Sheen: Low.
    d. Grain Direction: Vertical.

2.5 FINISH PANELS

A . Factory Finished Panel: Finish panels shall meet the finish classification requirement for the proposed location in the building.

1. Core Material: No Added Formaldehyde Medium Density Fiber Core (NAF MDF).

a. Features:

a. Flame Retardant MDF in accordance with ASTM E84 and TSCA Title VI compliant.

b. 1/8 inch (3mm) mass loaded vinyl adhered to back of panel for enhanced acoustic performance as scheduled.

2. Finish Material: Manufacturer standard options shall be classified in accordance with ASTM E84 as Class A per 2018 IBC 803.1.2 unless indicated otherwise. See Finish Schedule below for additional information.

a. Chroma Coat (PNT-#): Water based paint sprayed onto substrate.

a. Maximum Size: 60 x 120 inches (1524mm x 3048mm).

b. Wood Veneer (VEN-#): Natural and reconstituted wood adhered to substrate.

a. Maximum Size: 60 x 120 inches (1524mm x 3048mm).

c. WriteAway (MCF-#): Dry Erase 3D laminate film vacuum formed to substrate.

a. Maximum Size: 46 x 120 inches (1168mm x 3048mm).

3. Mounting: Face Mounted.

4. Thickness:

a. Typical: 1/2 inch (13mm).

b. With integral base: 3/8 inch (9.5mm).

B . Glass Finish Panel:

1. Glazing Material:

a. Tempered glass (GL-#): ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type 1, Class 1 (transparent), Quality q3. Complies with CPSC-16 CFR Part 1201 Category II per IBC 2015.2406.2.

a. Thickness: 3/8 inch (10mm).

b. Finish: Per Finish Schedule below.

b. Laminated Glass (GL-#): To AST C1172, Kind LA fabricated from two nominal 1/8 inch (3 mm) pieces of Type 1, Class 1, Quality q3, flat annealed transparent glass conforming to ASTM C1036. Complies with CPSC-16 CFR Part 1201 Category II per IBC 2015.2406.2.

a. Thickness: 3/8 inch (10mm).

b. Finish: Per Finish Schedule below.

c. Specialty Glass (GLS-#): approved by manufacturer prior to procurement or fabrication.

a. Finish and Features: Per Finish Schedule below.

2. Mounting: Center Mounted for glazed walls and doors.

a. Face Mounted Features:

a. Aluminum mounting rails to maintain alignment with adjacent finishes.

2.6 DOORS AND FRAMES

A . Coordinate ADA, ANSI, Access Control and Fire Life Safety requirements with drawings and schedules prior to the development of shop drawings per Pre-Manufacture Submittal requirements.

B . Hardware Preparation and Reinforcement: Factory milled, reinforced, drilled and taped doors and frames by manufacturer to receive Integrated Hardware Components as scheduled.

1. Factory milled doors and frames with hinge locations and sizes as determined by integrated interior assembly manufacturer; including factory installed steel backer plates.

2. Access Control Components: Factory provided rough in for Site Integrated Components and integrated interior assembly manufacturer provided hardware.

C . Aluminum Framed Glass Doors:

1. Operation: Swing and sliding.

2. Door Thickness: 1-11/16 inch (43mm) thick.

3. Door Size: As indicated on Door Schedule.

4. Stile Width: As indicated by Door Type on Door Schedule.

5. Top Rail Height: As indicated by Door Type on Door Schedule.

6. Bottom Rail Height: As indicated by Door Type on Door Schedule.

7. Glazing: (GL-1) Tempered] 3/8 inch (10mm).

8. Finish: As indicated on Door Schedule.

a. Clear Anodized Aluminum: AAMA 611, AAM12C22A31, Class I

b. Powder coat grade 2.

a. Color: Per schedule below.

c. Wood Veneer: Natural.

a. Species: Per schedule below.

b. Grade: 2.

c. Grain Direction: Vertical.

d. Sheen: Low.

9. Adjustability: Provide door skirt to accommodate varying floor levels.

D . Solid Core Wood Doors:

1. Operation: Sliding.

2. Door Thickness: 1-11/16 inch (43mm).

3. Door Size: As indicated on Door Schedule.

4. Door Panel: Factory finished high density fiberboard faces over particleboard core with solid wood edging.
5. Finish:
    a. Paint: Manufacturers standard Chroma Coat
        a. Grade: 2.
        b. Color: Per Finish Schedule below
    b. Wood Veneer: Natural.
        a. Species: Per Finish Schedule below.
        b. Grade: 2.
        c. Grain Direction: Vertical.
        d. Sheen: Low.
    c. Thermofoil: Manufacturers standard 3D laminate
        a. Grade: 2.
        b. Color/Pattern: Per Finish Schedule below.
6. Vision Lite: Sizes and configurations as indicated on drawings. Provide secure glazing stops on secure side of door.
    a. Glazing: (GL-#) per Finish Schedule below.

E . Door Frames:

1. Architectural grade structural aluminum factory finished and integrated with wall structure.
2. Door frames capable of reconfiguration without part replacement or damage to wall components.
3. Frames are shipped knocked down and assembled on site.
4. Jambs shipped over length by 2 inches (50 mm) in height, for field cutting to suit opening height for proper alignment with adjacent frames.
5. Extrusion Profile: Rectilinear.
6. Configuration: As required by door operation or function.
7. Size: As required for doors sizes indicated on Door Schedule.
8. Standard Frame Depth: 4 inches (102mm)
    a. Wrap Around frame: 4-3/4 inches (121 mm)
9. Finish:
    a. Clear Anodized Aluminum: AAMA 611, AAM12C22A31, Class I
    b. Powder coat grade 2.
        a. Color: Per Finish Schedule below.
    c. Wood Veneer: Natural.
        a. Species: Per schedule below.
        b. Grade: 2.

c. Grain Direction: Vertical.

d. Sheen: Low.

2.7 DOOR HARDWARE

A . Site Integrated Components: Provide in accordance with Division 08 Openings and Division 28 Electronic Safety and Security.

B . All Hardware indicated in this section to be provided by the manufacturer or the manufacturers distribution partner and installed on site unless indicated otherwise.

C . General Door Hardware: See door hardware specifications.

D . Sliding Door Hardware: Site installed manufacturer's standard sliding door track, track cover and door roller assembly with alignment pin on floor. Anti-rack and Anti-lift hardware included in track assembly.

1. Floor Track: None; Trackless
2. Positive Latch: Manufacturer's standard non-keyed, spring loaded, latch and strike that can secure sliding door panels to adjacent panels or jambs. Strike shall mount flush to surface of framing. Latch shall engage by closing action of door.
3. Operation:
   a. Soft close mechanism for door weights of 165 pounds (75 kg) or less.
   b. Pneumatic slow down mechanism for door weight of 165 to 200 pounds (75 to 90 kg).

E . Hardware Finishes: BHMA Standard finishes provided as follows unless indicated otherwise:

1. 626 - Satin Chrome: lever sets, flush bolt, dead bolt, metal roller catch, bolt, strike plate, dome floor stop and peg floor stop.
2. 628 - Satin Aluminum: electromagnetic locks,
3. 630 - Satin Stainless Steel: pulls.
4. CR Lawrence (CRL) Satin Anodized: Pivot Sets, Pivot Lock Sets.

F . Keying: Provide in accordance with Section 08 71 ## [door hardware section]

2.8 ELECTRICAL

A . Copper Conductors and Cables:

1. Armored Cable (Type AC): Multi conductor Type AC with 3, 5 or 8 insulated copper conductors in size #12 AWG factory assembled from the pre-terminated device with an additional 10 feet (3.05 m) extending from the top or bottom edge of the frame.
   a. Features:
      a. Conventional Wiring: Pig Tail conventional hard wire connection to base building branch circuit conductor per Division 26 requirements.
      b. Modular Wiring: Quick connect pre-terminated modular system for wiring modular devices per shop drawings.
      c. Extender Cable: Quick connect pre-terminated at both ends modular system for wiring modular devices per shop drawings.

d. Power Whip: Manufacturer standard modular connector at one end and Pig Tail conventional hard wire connection at opposite end for connection to base building branch circuit conductor per drawings and Division 26 requirements.

2. Modular Splitter: Modular cable quick connect device for power distribution to be secured to wall, floor or above ceiling per shop drawings.

3. Conventional Cable: Power conductors and cables not provided by manufacturer are provided in accordance with division 26.

B . Conduit:

1. Typical: Provide Electric Metal Tubing (EMT) conduit pathways 3/4 inch (19 mm) factory mounted within the integrated interior assembly structure, from outlet junction box to top or bottom of assembly to permit wiring installation and connections as specified in Divisions 26, 27, and 28.

a. Material: Coated steel.

2. Routing Through Posts Only: Provide UL listed flex conduit per ANSI/UL-1, NEC Type FMC fabricated of lightweight, high-strength aluminum alloy.

3. Refer to Division 26, 27, and 28 for additional conduit raceway and pull-string requirements.

C . Outlet Junction and Pull Boxes

1. Conventional back box and mounting bracket: Factory mounted.

2. Modular back box and mounting bracket: Factory mounted.

3. Specialty Back Box: Provide to manufacturer for factory mount.

D . Face Plates and Trim Rings:

1. Modular faceplates: Factory provided, Factory installed

a. Color: Stainless Steel

b. Construction: 2 adjustment screws at top and bottom for flush installation.

2. Modular trim rings: Factory provided, site installed.

a. Color: Grey.

3. Conventional face plates: Provide in accordance with division 26 requirements.

4. Engraving/Identification: Provide in accordance with division 26 requirements.

E . Wiring Devices

1. Pre-terminated 15 or 20 amp receptacle factory assembled in outlet junction box.

a. Color: White except as follows: **[Red for emergency circuits] [Ivory] [Orange] [Grey] [Blue] [Black]**

b. Ground Pin Orientation: [Down] [Up]

c. USB charging port as located per drawings: Type A, 5 amp, 5 volt

F . Electrical Branch Circuiting:

1. Modular Zone Distribution: Modular Zone boxes designed to hold 12 circuits (independent neutrals) or 16 circuits (shared neutrals) site installed per shop drawings.

a. Connections from modular devices to modular zone box with site installed modular splitters and extender cables.

b. Connection of modular zone boxes to conventional panel: Home run connections provided in accordance with requirements of Division 26 Electrical and manufacturers installation instructions.

2. Modular Panel Manager Distribution: Electrical distribution panel with 24 or 42 circuits installed inside or just outside the electrical room per shop drawings for full modular power distribution.

a. Connection of modular panel manager to conventional panel: Provided in accordance with Division 26 Electrical and manufacturers installation instructions.

b. Connections from modular devices to modular panel manager with modular splitters and extender cables in accordance with manufacturers installation instructions.

2.9 COMMUNICATIONS

A . Conduit:

1. Manufacturers proprietary aluminum 1 x 2 inch (25mm x 50mm) rectangular aluminum conduit factory mounted to assembly structure from device box to top or bottom of assembly to permit wiring installation and connections as specified in Division 27.

B . Outlet Junction and Pull Boxes:

1. Conventional back box and mounting bracket: Factory mounted.
2. Modular back box and mounting bracket: Factory mounted.
3. Specialty Back Box: Provide to manufacturer for Factory mounting.

C . Horizontal Cabling:

1. Provide in accordance with Division 27 requirements.

D . Face Plates and Trim Rings:

1. Modular faceplates: Factory provided, Factory installed
   a. Color: Stainless Steel.
   b. Construction: 2 adjustment screws at top and bottom for flush installation.
2. Modular trim rings: Factory provided, site installed.
   a. Color: Grey.
3. Conventional face plates: Provide in accordance with Division 27 requirements.
4. Engraving/Identification: Provide in accordance with Division 27 requirements.

E . Data Jack:

1. 8 pin modular RJ45 jack, CAT cable **[5e] [6] [6A]** factory assembled outlet.
   a. Color: As selected by architect.

2.10 SITE INTEGRATED COMPONENTS

A . Door Hardware – per division 08 and 28

2.11 ACCESSORIES

A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

B . Manufacturer's accessories required by the project:

1. Manufacturer Standard Wall Base: Mechanically fastened recessed and adjustable Santoprene base.
    a. Color: As selected by architect.
2. Manufacturer Standard Ceiling Trim: Mechanically fastened recessed and adjustable to accommodate up to a 1/2 inch (13 mm) gap between integrated interior assembly and base building elements
    a. Color: As selected by architect.
3. Ceiling Perimeter Hanger: Manufacturer provided 1-1/8 inch (29mm) exposed perimeter edge angle extrusion for supporting lay-in panel ceiling systems. Seismic Suspension Edge Clips to meet code required movement without 2 inch (51mm) wall angles and all other acoustical ceiling components per section 09 51 00 Acoustical Ceilings.
4. Opti-filler Pressure Fit Gaskets:
    a. Wall Panel Seal at Reveal: Provide extrusions and co-extrusions to fill voids between finish panels, at ceiling connections, and at base building connections as required. (both horizontal and vertical gaskets). Coordinate final locations of gaskets with manufacturer through the shop drawing process prior to procurement of fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A . Verify existing conditions meet the manufacturer's requirements before starting work.

1. Floor Levelness:
    a. Contiguous wall lengths less than 40 feet: Base building sub-floor shall be level within 3/8 inch over 10 feet.
    b. Contiguous wall lengths greater Than 40 feet: Base building sub-floor shall not exceed a maximum total floor flatness deviation greater than 1-1/2 inches.
2. Vertical leading edge of assembly structure to base building: Where partitions attach to adjacent walls, the finish face shall be plum within 1/2 inch over 10 feet.
3. Top of assembly structure to base building: Where partitions attach to bulkhead or soffit, the finish face shall be level within 1/2 inch over 10 feet.
4. Lay in Ceilings: Where partitions attach to lay-in ceiling grid, the grid shall be level within 1/4 inch over 10 feet.

B . Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 57 22 Construction Indoor Air Quality.

C . Verify field or hold-to control dimensions before fabrication of integrated interior assemblies. Coordinate fabrication schedule with construction schedule and progress to avoid delay in the work.

D . Examine all adjoining work including work by others.

E . Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

B . Locations to receive integrated interior assemblies shall be inspected for compliance with manufacturers requirements.

C . Survey floor to determine the nature of floor level and determine where special conditions exist beyond manufacturer’s standard leveling capabilities of 1-1/2 inch (38mm) total variation in floor level. Prepare sub-floor per section 03 54 16 – Gypsum Cement Underlayment.

D . Field conditions and pre-existing installations by others which may adversely affect installation or exceed the manufacturers limitations shall be corrected before installing walls.

3.3 INSTALLATION

A . General: Install all materials in accordance with manufacturer's instructions based on conditions present and pre-installation meeting.

B . All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 81 13 Sustainability Requirements.

C . All building services shall be installed and connected to the base building systems by licensed subtrades. All building services shall be inspected by authorized trade representatives and Authority Having Jurisdiction in the presence of a manufacturer representative. Coordinate with all affected parties as required.

D . Doors and frames

1. Install sliding doors plumb, level, square, and in proper alignment.
2. Install doors to close against walls without gaps
3. Install doors to open and close smoothly.
4. Anchor sliding doors securely to supports.

E . Electrical:

1. Electrical testing requirements provided in accordance with Division 26 Electrical.
2. Grounding paths must be verified in patient care areas.
3. Inspect all electrical installations as part of conventional electrical scope prior to installation of finish panels.
4. Installation sequence as determined by the certified installer and coordinated with the General Contractor based on project conditions.

F . Communications:

1. Communications testing requirements provided in accordance with Division 27 Communications.

3.4 FIELD QUALITY CONTROL

A . Electrical:

1. All building services shall be inspected by authorized trade representatives and the local building authority prior to installation of finishing panels. Refer to Shop Drawings for location of components incorporated into prefabricated walls.
2. In general, installation locations and dimensions are installed a typical distance from prefabricated wall edges, refer to Shop Drawings for more information.

B . Communications:

1. Install communications systems in accordance with Division 27 requirements.

3.5 ADJUSTING

A . Adjust and lubricate hardware for proper operation in accordance with manufacturer’s instructions.

B . Doors and Frames

1. Adjust for smooth and balanced door movement in accordance with manufacturer's instructions.
2. Adjust and lubricate hardware for proper operation.

3.6 CLEANING

A . Dispose of all waste material in accordance with Section 01 ## ## - [construction waste management section] and project's Waste Management Plan.

B . Upon completion of installation clean finishes in accordance with the manufacturer’s instructions. Avoid alkaline or abrasive agents. Avoid scratching or marring finishes.

3.7 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

3.8 DEMONSTRATION

A . Manufacturer’s representative will be responsible to provide general product training to the Owner or their outsourced operations team at time of installation as well as conduct a comprehensive training session(s) to convey the methodology, and assembly of the walls to sustain general operational maintenance by the Owner’s personnel with clearance over the facilities lifetime.

3.9 FINISH SCHEDULE

1. (ANO-1) Anodized:
   a. Type: Manufacturer Standard
   b. Color: Clear.
2. (PWD-1): Powder Coat
   a. Type: Color Match.
   b. Grade: 2.
   c. Texture: Smooth.
   d. Color Manufacturer: DIRTT or approved equal.
   e. Color Name: 045-17-1507.

f. Notes: [insert items like, Doors/ Frames/ Corner Posts].

3. (VEN-1) Wood Veneer:
   a. Type: Natural.
   b. Grade: 2.
   c. Species: Oak.
   d. Sheen: Low.
   e. Stain Finish: Clear.
   f. Grain Direction: Vertical.
   g. Notes: **[insert items like, Doors/ Frames/ Corner Posts/ Micro-Perforated].**
4. (GL-1) Glass:
   a. Type: Tempered.
   b. Color/Finish: Manufacturer Standard Clear.
   c. Thickness: 10 mm.
   d. Color Manufacturer: DIRTT or approved equal.
5. Finish Panels:
   a. (MCF-1) Magnetic Markerboard:
      a. Type: Porcelain Faced steel adhered to substrate.
      b. Color: White.
6. Finish Panels:
   a. (MCF-2) Magnetic Markerboard:
      a. Type: Porcelain Faced steel adhered to substrate.
      b. Color: #045-17-1507.

3.10 DOOR HARDWARE SCHEDULE

A . See door hardware schedule and specifications.

END OF SECTION

SECTION 21 05 10 – DESIGN-BUILD FIRE SUPPRESSION SYSTEMS

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. Fire suppression systems shall be provided by design-build subcontractor as follows:

1. Fire Suppression Systems Contractor shall provide for and obtain all necessary permits and inspections as required from regulatory agencies [Item].

2. Fire Suppression Systems Contractor shall be the permit holder and shall be responsible for the proper design and installation of the mechanical systems for the entire renovated space.

3. All Fire Suppression Systems work shall be Bidder design-build and shall comply with all governing code requirements. The Contractor shall ensure provision of a fire suppression system in compliance with codes, including for concealed spaces at combustible construction.

4. Specialty heads, including fully recessed and color finish-coated heads, are indicated on the ceiling plan. Heads shall be located as indicated in Drawings, where applicable.

B. Related Requirements:

1. Section 01 61 16 “Delegated Design Requirements”.

1.3 SUBMITTALS

A. Fire Suppression Systems Contractor shall provide:

1. Product data for all piping and devices.

2. Shop drawings required for review and approval by Architect prior to construction. Architectural plans illustrate fixture locations in some areas; these shall be indicated in shop drawings for review and approval.

3. Deferred Submittal for Permit: Following approval of shop drawings and product data, provide deferred submittal to the Authority Having Jurisdiction (AHJ) for Permit.

B. At completion, provide the following:

1. O&M manual for devices installed.

2. The contractor shall submit as-built drawings as AutoCAD files to the Owner.

1.4 QUALITY ASSURANCE

A. Fire Suppression Systems Contractor shall coordinate requirements with the intent of the Documents; Fire Suppression Systems Contractor shall perform calculations to verify piping is properly sized.

B. Coordinate work with plumbing and mechanical work on the Project.

C. Qualifications: Fire Suppression Systems designers and installers shall be training and certified for systems and equipment to be provided and installed.

PART 2 - PRODUCTS

2.1 REQUIREMENTS

A. Provide Automatic Sprinkler System meeting requirements of NFPA 13 for Class I Automatic Wet Standpipes.

1. Provide fire department connection (FDC).

2. Provide sprinkler heads at locations indicated, where applicable.

2.2 MATERIALS

A. Provide piping and fixtures of code-required materials and properly sized for services required.

B. Provide devices to match Owner's standard, except as follows:

1. Specialty heads at some applications, as indicated in Drawings.

2. Coated color finish at some applications, as indicated in Drawings.

3. Fire sprinklers at gypsum ceilings shall be pop-down-type with concealed cover plate.

PART 3 - EXECUTION

3.1 GENERAL

A. Conceal piping to the fullest extent possible. Where piping cannot be concealed, notify the Architect and coordinate locations to be as unobtrusive as possible. Where indicated, match Architect's layout and/ or locations requirements for piping and heads.

END OF SECTION

SECTION 23 05 00 - GENERAL HVAC PROVISIONS

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

A. General HVAC provisions apply to all work performed in Division 23.

B. The Contract Documents are complementary. What is required by any one, as affects this Division, shall be as binding as if repeated herein.

C. Separation of this Division from other Contract Documents shall not be construed as segregation of the Work.

D. Location of equipment on Drawings is approximate. Plan exact location with respect to site measurements and work of other trades prior to starting work. If measurements differ slightly, modify work. If measurements differ substantially, notify Architect/Engineer and Owner's Authorized Representative prior to fabrication.

E. Make minor changes in equipment connections and equipment locations as directed or required before rough-in without extra cost.

F. For products specified by listing one or more manufacturers, followed by "Similar to" and one manufacture's model number, the following requirements apply:

1. Approval of each listed manufacturer is contingent upon that manufacturer having a product which meets the specification, fits in the available space, and is comparable to the listed model.

2. Electrical requirements, duct requirements, pipe connections, and space requirements indicated on drawings are based on the listed model and may not be suitable for all manufacturers listed. Provide revisions required to accommodate the model actually furnished.

G. For product specified by listing one or more manufacturers, followed by a model number for each manufacturer, the following requirements apply:

1. Provide one of the listed model numbers or an approved substitution.

2. Electrical requirements, duct connections, pipe connections, and space requirements indicated on the Drawings are based on one of the listed models and may not be suitable for all models listed. Provide revisions required to accommodate the model actually furnished.

1.2 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): A federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority.

B. Owner's Authorized Representative (OAR): Owner's representative with authority to act on Owner's behalf.

C. Architect/Engineer: The design professional leading the design team and can be either an architect or engineer.

D. The words furnish, install and provide are defined as follows:

1. Furnish: To supply and deliver to the project ready for installation and in operable condition.

2. Install: To place in final position, complete, anchored, connected in operable condition.

3. Provide: To furnish and install complete. Includes the supply of specified services.

4. When neither furnish, install or provide is stated, provided is implied.

1.3 COORDINATION

A. Check drawings of other trades to avert possible installation conflicts. Should major changes from original drawings be necessary to resolve such conflicts, notify Architect/Engineer and secure written approval and agreement on necessary adjustments before start of work.

B. Architectural drawings govern all other drawings. Consult in detail the door swings, counter heights and similar items affecting work before rough-in.

C. Coordinate identification systems with other trades. All mechanical systems shall use identical piping, valve, and equipment identification and regulatory signage.

1.4 SUBMITTALS AND SHOP DRAWINGS

A. See Division 01.

B. Action Submittal Content

1. Action submittal information not expressly required by the specifications will not be reviewed.

2. Action submittal information shall be provided in sufficient detail to establish conformance with specified requirements. Where submitted literature includes multiple models, features, or options, the specific models, features, or options proposed shall be clearly indicated. Where a brief inspection shows that product data is not complete, the submittal will be rejected without review.

3. Action submittal data shall be clear, concise, legible, and relevant. Where data is not properly organized and contains significant information that is not relevant, the submittal will be rejected without review.

4. Action submittal requirements are listed in individual specification sections. The following definitions apply.

a. Materials List: Provide tabular list of materials including specification reference, specification product name, manufacturer, model/part number, and size and/or quantity where appropriate. Do not include supplemental data, except where specifically requested.

b. Catalog data: Manufacturer’s standard product cut sheet.

c. Product Data: Detailed data including dimensions, weight, materials of construction, connections, and all other information needed to confirm that the product conforms to all requirements listed in the individual specification section.

d. Performance Data: Capacity, input, output, flow, etc. as required to confirm that the product meets the performance requirements scheduled in the Specifications or on the Drawings.

e. Wiring Diagrams: Power and control wiring diagrams.

f. Shop Drawings: Construction drawings of items manufactured specifically for this project including dimensions, construction details, weights, and additional information to identify the physical features of the system or piece of equipment.

g. Installation Instructions

h. Special Requirements Listed: Additional requirements indicated in individual specification sections.

C. Delegated Design

1. The Contractor shall provide delegated design services where indicated in the Contract Documents and obtain necessary approval from the AHJ. The Contractor shall be responsible for the design, calculations, submittals, permits, fabrication, transportation and installation of these Delegated Design components. The Contractor is responsible to submit all Delegated Design documents required for approvals by regulatory agencies for each item of delegated design work.

2. Delegated design work shall be performed by a register professional engineer or architect specializing in the associated work and registered in State in which the work is performed where required by the AHJ or as specified herein.

3. Comply with requirements of the AHJ over the Work current at the time of submission. The Contractor is responsible to coordinate and submit all material required by the AHJ so review and process of submittals and permits will not adversely affect the construction schedule. Each Delegated Design item requiring review by the AHJ must be provided by the Contractor and all fees and costs associated therewith shall be the Contractor's responsibility at no additional cost to the Owner.

4. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

    a. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

5. Delegated-Design Services Certification: In addition to shop drawings, product data, and other required submittals, submit digitally signed PDF electronic file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

    a. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.5 QUALITY ASSURANCE

A. All materials and equipment provided hereunder shall be installed and started in complete conformance with the manufacturer's recommendations.

B. Asbestos products or equipment or materials containing asbestos shall not be used.

C. Certify that each welder has passed the American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.

1.6 DESIGN REQUIREMENTS

A. Equipment and systems provided hereunder shall be rated to provide performance specified and scheduled on Drawings at the elevation of the project site.

B. Materials and equipment provided hereunder shall be rated for the service conditions of the system to which they are connected including but not limited to temperature, pressure, and humidity.

1.7 CODES AND STANDARDS

A. Applicable codes and standards shall determine minimum requirements for materials, methods, and labor practices not otherwise stated herein.

B. Work shall comply with the Americans with Disabilities Act (ADA).

1.8 SEQUENCING

A. Testing, adjusting, and balancing of HVAC systems will begin after commissioning construction checks and equipment start-up are complete and Systems Ready to Balance Checklist forms have been executed and submitted.

B. Submit control verification reports three weeks after Substantial Completion.

C. Submit draft operations and maintenance manuals to Owner’s Authorized Representative 30 days prior to substantial completion.

D. Operator training shall be performed prior to Substantial Completion, or as otherwise approved by the Owner’s Authorized Representative.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place.

B. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting, and scoring. Do not install damaged products.

D. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

E. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.

F. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remover coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

G. Replace installed products damaged during construction.

1.10 TEMPORARY SERVICES

A. Provide in accordance with Division 01 as required for completion of work.

B. Maintain existing systems operational. Owner will be responsible to operate and maintain existing equipment during the course of the project. However, any damage to existing equipment resulting directly from work under this Contract shall be repaired by the Contractor at no expense to Owner.

C. All mechanical systems currently operating including HVAC equipment and controls, which serve Owner occupied areas, must be maintained operational during construction. It is the responsibility of the Contractor to provide temporary facilities as required to maintain operation. If any system currently in use must be turned off to perform work, permission must be obtained, and owner notified prior to performing any work.

1.11 OPERATIONS AND MAINTENANCE MANUALS

A. Furnish operation and maintenance data for project, as described herein.

B. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF files.

1. Include a directory of all subcontractors and maintenance contractors with names, addresses, and telephone numbers, indicating the area of responsibility for each.
2. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
3. Provide a composite summary table indicating each item of equipment listed in the operations and maintenance manual and its required maintenance and time period. This summary table shall be the first section in the O&M manual.
4. Manual Content: Manuals shall contain complete information for each item of mechanical, electrical or other operating equipment. Include as applicable:
    a. Manufacturer's instructions for installation, startup, operation, inspection, and maintenance
    b. Lubrication schedules
    c. Performance capacity
    d. Final approved product submittals for each product included in project.
        1) Mark the model actually provided where the literature covers more than one model. Include all submittal data corrected to "as-built" conditions within the manual.
        2) Parts list
    e. Maintenance schedules
    f. Maintenance instructions shall indicate routine-type work with step-by-step instructions that should be performed to ensure long life and proper operations. Recommended frequency of performance shall also be included.
5. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

C. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, [**loose-leaf**] [**post-type**] binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
2. Provide a composite summary table indicating each item of equipment listed in the operations and maintenance manual and its required maintenance and time period. This summary table shall be the first section in the O&M manual.
3. Manual Content: Manuals shall contain complete information for each item of mechanical electrical or other operating equipment. Include as applicable:
    a. Manufacturer's instructions for installation, startup, operation, inspection, and maintenance
    b. Lubrication schedules
    c. Performance capacity
        1) Final approved product submittals for each product included in project.

a) Mark the model actually provided where the literature covers more than one model. Include four copies of all submittal data corrected to "as-built" conditions within the manual.

b) Parts list

d. Maintenance schedules

e. Maintenance instructions shall indicate routine-type work with step-by-step instructions that should be performed to ensure long life and proper operations. Recommended frequency of performance shall also be included.

1.12 RECORD DRAWINGS

A. Provide record "as-built" drawings in accordance with Division 01 requirements. Show all deviations from contract drawings and location of underground lines by accurate dimensions from building lines. Show depth of all stub outs and underground lines. Dimension all concealed piping from column grids or building lines. Alternately, provide electronically using .pdf markup of contract drawings.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MATERIALS

A. All materials employed in permanent construction shall be new, full weight, in first class condition, and suitable for space provided. All similar equipment and materials shall be of one manufacturer.

B. Equipment used as the basis of design is scheduled on Drawings or designated in product specifications. If Contractor chooses to use equipment that is not the basis of design, Contractor is responsible for all re-design and construction costs associated with variations in arrangement, dimension, or capacity. Such work may include, but is not limited to, changes to facility structure or dimensions and revisions to associated mechanical and electrical systems needed to provide equal system performance and maintainability.

2.2 FIRESTOPPING

A. Comply with Division 07.

B. Acceptable Manufacturers: 3M, Hilti, Tremco, Nelson Firestop Products.

C. Provide firestopping for the following:

1. All penetrations through fire resistance rated floors, walls and partitions including openings containing pipes, ducts and other penetrating items.

2. All penetrations through non-fire resistance rated floors where the vertical service riser penetrates three or more floors.

D. Firestop system shall be UL Classified for the application and correspond to those indicated by reference to designation listed by UL Fire Resistance Directory.

E. Material shall be tested in accordance with UL-1479, ASTM E-814 for the specific fire-rated construction conditions confirming to construction assembly type, penetration item type, annular space requirements, and fire-rating involved.

PART 3 - EXECUTION

3.1 ACCESS TO EQUIPMENT AND ACCESSORIES

A. Install equipment with sufficient access for service. Where not conveniently accessible by other means, provide adequately sized access doors for valves, dampers, motors, belts, and all other

mechanical equipment requiring access for removal or maintenance. Type, size and exact location of access doors shall be coordinated with Architect/Engineer prior to work.

B. Provide clearances for maintenance access as indicated on Drawings or as recommended by manufacturer. If access requirements shown on Drawings conflict with manufacturer's recommendations, provide larger clearance of the two.

C. If equipment location shown on Drawings does not allow required access, notify Architect/Engineer prior to start of work.

D. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between the manufacturer's instructions and the contract drawings and specifications to Architect/Engineer for resolution prior to starting work.

E. Provide access doors as required for access to mechanical equipment. Doors required for access are not necessarily shown on Drawings. Consult with Architect/Engineer for direction on placement of required doors not shown on Drawings.

1. Comply with manufacturer's instructions for installation of access doors. Provide all necessary support and supplemental framing for assembly where the access doors are required. Set accurately in position, plumb, level, and flush to adjacent finish surfaces; and secure to support.

F. Where ladder access is required to service elevated components, provide an installation that provides for sufficient access within ladder manufacturer's written instructions for use.

G. Comply with OSHA regulations.

3.2 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, lights, electrical outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

B. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.

C. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.

D. Minor Piping: Small diameter pipe runs from drips and drains, water cooling, and similar minor services are generally not shown but must be provided. Contractor is responsible to provide all such minor piping where needed to maintain mechanical spaces clean and dry and to allow full equipment function and maintenance.

E. Interconnection of Controls and Instruments: Generally not shown but must be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments, and computer workstations. Comply with NFPA-70.

F. Work in Existing Building: Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner's Authorized Representative. Locate openings that will least affect structural slabs, columns, ribs, or beams. Refer to the Architect/Engineer for determination of proper design for openings through structural sections and obtain layout approval prior to cutting or drilling into structure. After Architect/Engineer approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.

G. Inaccessible Equipment

1. Where the Owner's Authorized Representative determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance,

equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.

2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.3 EXISTING EQUIPMENT REUSED OR RELOCATED

A. All equipment designated as existing or furnished by Owner shall be cleaned and repaired before reinstallation. Any items requiring repair shall be brought to the attention of the construction manager before the item is reinstalled. Damage not brought to the attention of the construction manager shall be deemed the result of reinstallation of the item and shall be repaired without expense to the Owner.

3.4 MECHANICAL SYSTEMS FIRESTOPPING

A. Do not cover firestop installations until they are examined by the Authority Having Jurisdiction, if required.

B. Install firestopping in accordance with manufacturer’s recommendations and conditions of product UL listing.

3.5 CLEANING SYSTEMS

A. General: After all equipment, pipes and duct systems are installed, system shall be thoroughly cleaned. Remove all stickers and tags from equipment or fixtures. Clean all piping systems prior to installation of insulation or painting.

B. Hydronic Piping: Clean and flush hydronic piping and strainers as required to complete work described in Section 232513 – Water Treatment for Hydronic Systems.

C. Air Distribution Duct System:

1. Remove all debris from system before operation. Under no circumstances shall system be operated without filters. Replace filters used during construction with new filters.

2. Repair or replace any discolorations or damage to system, building finish, or furnishings resulting from Contractor’s failure to properly clean system.

3.6 START UP

A. The Mechanical Contractor shall be responsible for proper operation of all systems and shall coordinate startup procedures, calibration and system checkout. System operational problems shall be diagnosed and corrected as required for system operation prior to Substantial Completion inspection.

B. Start equipment in accordance with manufacturer’s recommendations and under manufacturer’s supervision where required. Ensure that associated filters, strainers, electrical overloads, and other devices intended to protect the equipment are installed and functional prior to startup.

C. Verify that piping has been flushed and cleaned prior to startup.

D. The Mechanical Contractor shall perform TAB system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. TAB system-readiness checklists will be provided by the TAB Specialist. See Section 230593 - Testing, Adjusting, and Balancing for HVAC.

3.7 DEMONSTRATION

A. General: After installation is complete, demonstrate to Engineer and Owner's Authorized Representative satisfaction as being complete and operational and entirely in conformance with Contract Documents.

B. Preparation: Prior to demonstration, submit check-off list indicating completeness of submittals and certificates of compliance for review to Owner's Authorized Representative. Operate completed system for one week. Verify that control verification is complete and verification report has been approved by Architect/Engineer.

C. Arrange for demonstration with Owner's Authorized Representative, Engineer, required factory technicians, and installer at least one week in advance of demonstration.

3.8 TRAINING

A. Instruct Owner in proper operation and maintenance of equipment and systems. Instruction shall generally include topics listed in manufacturer's operations and maintenance manual. Operator instructions shall cover all aspects of manual, automatic, and safety controls. Contractor shall also instruct the Owner in the general configuration of systems and location of equipment and components.

B. Furnish competent qualified technicians knowledgeable in the building HVAC systems and equipment provided for this project for a minimum of 2 hours on-site to instruct Owner in operation and maintenance of systems and equipment. This figure does not include additional training noted under individual specification sections. Contractor shall keep a log of this instruction including date, times, subjects, and those present and shall present such log when requested by Engineer. Contractor shall coordinate training with Owner's Project Manager and provide a schedule for training minimum two-weeks prior to Substantial Completion. All training shall be complete 30-days after Substantial Completion.

C. Contractor shall furnish training by equipment manufacturers in addition to training described in this section where specifically listed in other sections. Contractor shall schedule training with Owner's Project Manager minimum 48-hours prior to training session. Equipment shall be fully operational prior to scheduling training session. Manufacturer's field start-up, adjustment, and service will not fulfill manufacturer's training requirement.

D. Contractor shall coordinate operator training with the Owner's Authorized Representative as follows:

1. Training Schedule: Contractor shall develop and submit a training schedule listing all required training including contractor training, manufacturer training, and factory training as specified for approval by the Owner's Authorized Representative.

2. Training Record and Evaluation Section: Contractor shall maintain a Training Record documenting attendees and duration of each training session. The Contractor shall complete Training Record after each training session. Submit training record when all training is complete.

END OF SECTION

SECTION 23 05 23 - VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Valves for HVAC service.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NRS: Non-rising stem.

D. RS: Rising stem.

1.3 ACTION SUBMITTALS

A. Catalog Data: For each type of valve.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle and globe valves closed to prevent rattling.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B31.1 for power piping valves.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

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 and Temperature Ratings: Not less than indicated and as required for maximum system pressures and temperatures. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valves in Insulated Piping:

1. Include 2-inch stem extensions.

2. Ball Valves:

a. Extended operating handle of nonthermal-conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.

b. Memory stops shall be fully adjustable after insulation is applied.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BALL VALVES

A. NPS 2 and Smaller:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves.

b. Hammond Valve.

c. Jenkins Valves; Crane Energy Flow Solutions.

d. Milwaukee Valve Company.

e. NIBCO INC.

f. Stockham; Crane Energy Flow Solutions.

g. Watts; a Watts Water Technologies company.

2. Bronze Ball Valves with Stainless-Steel Trim:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig.

c. CWP Rating: 600 psig.

d. Body Design: Two-piece.

e. Body Material: Bronze.

f. Ends: Threaded.

g. Seats: PTFE.

h. Stem: Stainless-steel.

i. Ball: Stainless-steel.

j. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges to isolate 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.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL VALVE APPLICATIONS

A. Drain Valves:

1. Where drain valves are required, include hose end connection and cap with EDPM gasket.

2. Provide drain down valves at the low point in each zone, area of service, or floor level.

3. Provide drain down valves to drain equipment.

B. Strainer Blowdown Valves:

1. Match blowdown connection.

2. Provide hose end connection and cap with EDPM gasket for valves 1-inch and below.

C. Provide valves for isolation of services as shown on Drawings and at the following locations:

1. At branch connections from piping risers at each floor.

2. Major branches and branches to remote equipment or fixtures for all supply and return systems.

3. As required to individually isolate all equipment and maintainable devices including automatic air vents and hydronic control valves.

D. Provide valves where recommended by equipment manufacturer’s installation instructions.

3.5 VALVE SCHEDULE

A. If valve type shown on drawings is different than type indicated below, notify Engineer prior to ordering to verify type.

B. General Heating Water Service

1. General Shutoff Service

a. NPS 2 and smaller: Ball Valves with Stainless-steel Trim

2. Drain, Gauge Stop, Strainer Blowdown: NPS 2 and smaller: Ball Valves with Stainless-steel Trim

END OF SECTION

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Specification 055000: Metal Fabrications.

C. Specification 230548: Vibration and Seismic Controls for HVAC.

D. Specification 233113: Metal Ductwork.

1.2 SUMMARY

A. Design and installation of hangers and supports for HVAC piping and equipment provided in Division 23. Exceptions include equipment whose structural attachment has been designed by the design team structural engineer.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

B. ASME: American Society of Mechanical Engineers

C. MFMA: Metal Framing Manufacturers Association

D. ASCE: American Society of Civil Engineers

E. ASTM: American Society for Testing and Materials

1.4 PERFORMANCE REQUIREMENTS

A. 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. Supports for multiple pipes, including pipe stands, shall be capable of supporting combined weight of supported systems, system contents, and test water.

2. Equipment supports shall be capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Provide submittals for products listed in the Product Table below in accordance with Section 230500 – General HVAC Provisions Submittal requirements indicated by column number designation as follows:

1. Materials List

2. Catalog Data

3. Detailed Data

4. Performance Data

5. Wiring Diagrams

6. Shop Drawings

7. Installation Instructions

8. Special Requirement listed herein.

PRODUCT TABLE	1	2	3	4	5	6	7	8
Pipe Hangers and Supports		X						
Thermal Hanger Shield Inserts		X						

1.6 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 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. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper-Coated 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 copper-coated 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 INSULATION INSERTS

A. General: Insulation insert for use with MSS Type 40 protection shield

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Foamglas

2. ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

3. ASTM C1126 Type III phenolic foam with factory laminated ASJ.

a. 1-1/2” to 2-1/2” pipe size: 32 psi at load point.

b. 3” to 6” pipe size: 85 psi at load point.

c. 8” to 12” pipe size: 135 psi at load point

B. Insulation-Insert Material for Hot Piping, 200 °F and less:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Insultherm

b. Johns Manville

c. Resolco, Inc.

2. ASTM C1126 Type III phenolic foam with factory laminated ASJ.

a. Maximum Temperature: 220°F

b. Maximum Load:

1) 1-1/2” to 2-1/2” pipe size: 32 psi at load point.

2) 3” to 6” pipe size: 85 psi at load point.

3) 8” to 12” pipe size: 135 psi at load point

3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Johns Manville

b. Thermal Pipe Shields

4. Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-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. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated 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 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, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, 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-89Install 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-89Arrange 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. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

E. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

F. Install lateral bracing with pipe hangers and supports to prevent swaying Coordinate with Section 230548 – Vibration and Seismic Controls for interrelated work.

G. Install building attachments within concrete slabs or to structural steel where possible. 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.

H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

I. Insulated Piping:

1. Piping Operating Above 180 degrees:

a. Steel Piping 4-inches and Larger: Provide MSS Type 39 Protective Saddle.

b. All Other Piping 1-1/2-inches and larger: Provide Insulation Insert with MSS Type 40 protection shield.

c. All Piping 1-1/4-inches and smaller: Provide MSS Type 40 protection shield.

2. Shield Dimensions for Pipe: Not less than the following:

a. NPS (Nominal Pipe Size) 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

3. Insulation Inserts: 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 HANGER SPACING

A.

HYDRONIC PIPING SPACING TABLE	Maximum Horizontal Span	Maximum Vertical Spacing
Carbon Steel and Stainless-steel		
1-1/4 inch and smaller	7 feet	15
Copper Tubing		
¾ inch and smaller	5 feet	10
1 inch to 2 inch	7 feet	10

3.6 ROD SIZES

A. Select rod diameter to not exceed the maximum safe load listed in Table 2 of MSS SP-58-2009.

3.7 HANGER AND SUPPORT TYPE SCHEDULE

A. Single Pipe, Hung and Insulated

1. Operating Temperature Less Than 140 Degrees: Steel Clevis, MSS Type 1

2. Operating Temperature 140 Degrees and Above.

a. NPS ½ to NPS2: Steel Clevis, MSS Type 1.

b. NPS 3 and Larger: Adjustable Roller Hanger: Type 43.

B. Multiple Pipe Trapeze or Pipe Rack: Trapeze Hanger, MSS Type 59.

1. Uninsulated Piping: Steel Strap.

2. Insulated Piping: Adjustable Roller, MSS Type 43.

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 metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. To eliminate the need for seismic restraint, for piping installation where the distance from the top of the pipe to the structure is 12 inches or less for the entire run, select hanger-rod and building attachments to allow pipe movement without stress on hangers and attachments.

I. Hanger-Rod Attachments: Unless otherwise indicated, provide 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°F piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450°F piping installations.

J. Building Attachments: Unless otherwise indicated, provide the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

K. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications.

L. Comply with MFMA-103 for metal framing system selections and applications.

M. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Valve tags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION

A. Coordinate with Division 22. Match manufacturer, type, and style of identification used.

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Marking Services, Inc.
3. Seton Identification Products.

2.2 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: 0.025-inch aluminum. Predrilled or stamped holes for attachment hardware.
2. Letter Color: Black.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 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-quarters the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.

6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. 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. Engraved to show white lettering on black background except for labels attached to ceiling grid or located within finished spaces shall have black lettering on white background.

3. Maximum Temperature: Able to withstand temperatures up to 160°F.

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. Minimum Letter Size: 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-quarters the size of principal lettering. Lettering on labels attached to ceiling grid largest size practical.

6. Fasteners: Stainless-steel rivets or self-tapping screws.

7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number.

D. Equipment Label Schedule: For each item of equipment to be labeled, prepare equipment label schedule on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid 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; also include 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: Size letters according to ASME A13.1 for piping.

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: Yellow.

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-quarters 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; also include 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.

2.5 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.

2. Marking Services Inc.

3. Seton Identification Products.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Polished brass, 0.025-inch aluminum and having predrilled or stamped holes for attachment hardware.

2. Minimum Tag Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4-inch.

3. Fasteners: Brass wire-link chain or S-hook.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

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 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Ceiling Grids and Access Openings: Label ceiling grid and wall/ceiling access doors and to indicate key access points for equipment, valves, control devices and other components requiring quick access or routine maintenance. Provide a clear adhesive label and bold black lettering with component identification information, except were Owner has establish

identification standard label in accordance with Owner's standards. Place label on ceiling metal grid and not on removable tiles.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: 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 flange.
3. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
4. Near penetrations and on both sides of walls, floors, ceilings, and inaccessible enclosures.
5. At access doors, manholes, and similar access points that permit view of concealed piping.
6. Near major equipment items and other points of origination and termination.
7. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule: Letter and background color in accordance with ANSI A13.1.

3.5 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. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, faucets, convenience and lawn-watering hose connections, and isolation valves for HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves with captions as indicated in the following subparagraphs:

1. Valve-Tag Information: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch valve tag numbers.

2. Valve-Tag Information: Stamped or engraved with 1/4-inch letters and 1/2-inch valve tag numbers as listed below:
    a. Valve tag number.
    b. System abbreviation.
    c. Area served.
    d. Normal position.

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 and equipment.
2. Balancing hydronic piping systems and equipment.
3. Testing, adjusting, and balancing existing systems and equipment.
4. Control system measurement and verification.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB Specialist: An independent entity meeting qualification to perform TAB work.

E. TAB Project Supervisor: Certified individual employed by balancing contractor having administrative and technical responsibility for work performed under this Section.

F. TAB: Testing, adjusting, and balancing.

1.3 PREINSTALLATION MEETINGS

A. TAB Conference: Conduct a TAB conference after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details and procedures. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.

1. Minimum Agenda Items:
    a. Existing Conditions Report.
    b. Contract Documents Examination Report.
    c. Strategies and Procedures Plan.
    d. Coordination and assistance of trades and subcontractors to support TAB work.
    e. System-readiness checks.
    f. Construction schedule allowances for TAB work.
    g. TAB reports and resolution of issues identified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 15 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in Part 1 "Quality Assurance" and Part 3 “TAB Specialist.”

B. Pre-construction TAB Reports:

1. Existing Conditions TAB Report: Within 30 days of Contractor's Notice to Proceed, submit the as specified in Part 3 “Procedures for Testing, Adjusting, and Balancing Existing Systems.”

2. Contract Documents Examination Report: Within 60 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3 “Examination.”

C. 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.

D. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

E. Instrument Calibration Report: Within 60 days of Contractor's Notice to Proceed. Report to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

F. Progress Reports: Submit the as specified in Part 3 “Progress Reporting.”

G. TAB reports.

1. Draft TAB Report
2. Certified Final TAB report.
3. Sound Test Report
4. Vibration Test Report
5. Verification of TAB Report

1.5 QUALITY ASSURANCE

A. All work under this Section shall be performed under the direction of the Certified TAB Supervisor.

B. TAB Specialists Qualifications: Certified by AABC or NEBB.

1. TAB Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
2. TAB Technician: Employee of the TAB specialist working under the supervision of the TAB Supervisor.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

1.6 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

A. Subject to compliance with requirements, engage one of the following:

1. Air Balancing Specialties.
2. Air Introduction and Regulation, Inc.
3. Neudorfer Engineering, Inc.
4. Southern Oregon Engineering Services, Inc.

3.2 EXAMINATION

A. Contract Document Examination:

1. 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.
2. Confirm that balancing devices and provisions are included to facilitate TAB work. Provide listing of any devices and provisions required that are on included in the Contact Documents.
3. Contract Documents Examination Report: Based on examination of the Contract Documents, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Construction Examination:

1. Examine the approved submittals for HVAC systems and equipment.
2. 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.
3. 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.
4. Examine ceiling plenums used for return air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed airtight as required.
5. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
6. Examine test reports specified in individual system and equipment Sections.
7. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible, and their controls are connected and functioning.
8. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

9. Examine control valves for proper installation and orientation for their intended function of throttling, diverting, or mixing fluid flows. Verify the pipe connections are in accordance with manufacturers recommendations.
10. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
11. 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.

3.3 PREPARATION

A. Strategies and Procedures Plan: Prepare a TAB plan that includes the following:
   1. Equipment and systems to be tested.
   2. Strategies and step-by-step procedures for balancing the systems.
   3. Instrumentation to be used.
   4. Sample forms with specific identification for all equipment.

B. Prepare system-readiness checks of HVAC systems and equipment to be executed by the Mechanical Contractor to verify system readiness for TAB work. Include, at a minimum, the following:
   1. Airside:
      a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
      b. Duct systems are complete with terminals installed.
      c. Volume, smoke, and fire dampers are open and functional.
      d. Automatic temperature-control systems are operational.
      e. Ceilings are installed.
      f. Windows and doors are installed.
      g. 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. Suitable access to balancing devices and equipment is provided.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
   1. Comply with requirements in ASHRAE 62.1, "Air Balancing."

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, install test ports and duct access doors as required in Section 233300 – Air Duct Accessories. Otherwise, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 – Duct Insulation, Section 230716 – HVAC Equipment Insulation, and Section 230719 – HVAC Piping Insulation.

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.

3.5 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. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 – Metal Ductwork.

L. Air Inlets and Outlets:

1. Supply Diffusers: Set airflow patterns of adjustable outlets for proper distribution without drafts.

M. Control Parameters and Setpoints:

1. VAV System Supply Air Static Pressure Setpoints: Identify 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.

2. Minimum Ventilation Rates: Measure and adjust outside-air, return-air, and relief-air dampers for proper position to achieve minimum outdoor-air conditions. Determine setpoint values for specific control sequences controlling damper operation.

a. VAV systems: Measure ventilation rates at maximum and minimum system airflow conditions.

3. Terminal Units:

   a. Measure airflow and adjust calibration factors at minimum and maximum airflow. If no minimum calibration is available, note any deviation from design airflow.

   b. Calibrate and balance each terminal unit for maximum and minimum design airflow.

   c. For terminal units serving pressure-controlled spaces, verify that the differential between entering and leaving airflow remains constant over the full range of operating conditions. Note any deviation in the design airflow differential or room pressure.

4. Airflow Transmitters: Perform field verification and calibration of BAS airflow flow transmitters. Airflow verification shall be performed by duct traverse in straight section of ductwork to provide measurement accuracy of +/- 5%.

5. Record verification measurement. calibration parameters, and setpoints in Final TAB Report.

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 highest vent for adequate pressure.

2. Check flow-control valves for proper position.

3. Check that air has been purged from the system.

D. Flow Adjustments:

1. Perform temperature tests after flows have been balanced.

2. Adjust memory stops on balancing devices.

E. Record verification measurement. calibration parameters, and setpoints in Final TAB Report.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.

2. Water flow rate.

3. Water pressure drop for major (more than 20 gpm) equipment coils, excluding unitary equipment such as reheat coils, unit heaters, and fan-coil units.

4. Dry-bulb temperature of entering and leaving air.

5. Airflow.

3.8 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

2. Verify that the system static pressure sensor is located in the duct or piping system as specified or as shown on drawings.

3. Verify the operation of valve and damper actuators. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions in Final Report.

3.9 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work. TAB shall be performed to achieve system performance shown on Drawings and as specified. TAB shall be performed for interrelated equipment and systems which are not otherwise modified, but where testing, adjusting, and balancing is required to achieve overall system performance and to maintain existing equipment and systems that are unmodified operating at preconstruction conditions.

1. Compare the indicated airflow of the renovated work to the measured fan airflows and determine the new fan speed and the face velocity of filters and coils.

2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.

3. If calculations increase or decrease the airflow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.

4. Balance each air outlet.

B. Perform preconstruction inspection and measurement operating condition of existing equipment interconnected with new work and will remain and be reused. Preconstruction tests shall be performed within 30 days of the Contractors Notice to Proceed and prior to the beginning of any construction work and other activities that affect the performance of existing systems and equipment. If measurements are not performed as specified, comprehensive testing, adjusting, and balancing shall be performed for all interconnected systems and equipment.

1. Measure and record the operating speed, airflow, and static pressure of each fan.

2. Measure motor voltage and amperage. Compare the values to motor nameplate information.

3. Check the refrigerant charge.

4. Check the condition of filters.

5. Check the condition of coils.

6. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

C. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.

2. Coils are clean and fins combed.

3. Drain pans are clean.

4. Fans are clean.

5. Deficiencies noted in the preconstruction report are corrected.

D. Prepare an Existing Conditions TAB Report documenting inspections and measurements.

3.10 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Air Outlets and Inlets: Plus or minus 10 percent.

2. Heating-Water Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.11 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. Test reports shall be fully executed reports forms confirming to standard NEBB or AABC documentation standards.

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. Settings for supply-air, static-pressure controller.
    g. 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 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. Instrument Calibration Reports:
1. Report Data:
    a. Instrument type and make.
    b. Serial number.
    c. Application.
    d. Dates of use.
    e. Dates of calibration.

3.12 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. Prepare Seasonal Test Report of measurements and adjustments.

END OF SECTION

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulation of HVAC ductwork.

1.2 ACTION SUBMITTALS

A. Provide submittals in accordance with Section 230500 – General HVAC Provisions as follows:

1. Provide catalog data for all products. Indicate thermal conductivity, water vapor permeance, and jackets (both factory and field applied) if any.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Insulation materials and accessories shall be installed in a professional manner by skilled and experienced workers who specialize in commercial insulation work.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. 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.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation

b. Johns Manville, a Berkshire Hathaway company

c. Knauf Insulation

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. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

C. FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

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 at 43-mil dry film thickness.

2. Service Temperature Range: Minus 20 to plus 180°F.

3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

4. Color: White.

2.4 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°F

4. Color: Aluminum.

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. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with Kraft paper backing; complying with ASTM C 1136, Type II.

2.6 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

2. Thickness: 6.5 mils

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.7 SECUREMENTS

A. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

3. 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 thick by 2 inches square.

b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-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.

4. 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 thick by 2 inches square.

b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

c. Adhesive-backed base with a peel-off protective cover.

5. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel or aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

6. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 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. Keep insulation materials dry during application and finishing.

F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

G. Install insulation with least number of joints practical.

H. 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.

I. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

J. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge.

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.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (Not Fire Rated): Install insulation continuously through walls and partitions.

B. 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.

3.5 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, and manufacturer’s recommended 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 support pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

b. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

c. Do not over-compress insulation during installation.

d. Impale insulation over pins and attach speed washers.

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 from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch 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°F at 18-foot 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.

5. 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.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner reserves the right to perform tests and inspections.

B. Tests will include removing field-applied jacket and insulation in layers in reverse order of their installation for each duct system schedule as directed by the Owner.

C. If sample inspection reveals noncompliance with requirements, all similar insulation applications will be considered defective Work and will be replaced at no expense to the Owner.

3.7 DUCT INSULATION SCHEDULE

A. Insulate all plenums and ductwork as scheduled with the following exceptions.

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.

2. Factory-insulated flexible ducts.

3. Factory-insulated plenums and casings.

4. Flexible connectors.

5. Vibration-control devices.

6. Factory-insulated access panels and doors.

B. Insulate ductwork located indoors in conditions spaces:

1. Supply Air.

a. Insulate ductwork where the air supply temperature is:

1) More than 10^{o}F below that space cooling temperature setpoint or below 60^{o}F.

2) More than 15^{o}F above the space heating temperature setpoint.

b. Concealed ductwork:

1) Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density, FSK jacket.

C. Insulate supply and return ductwork located indoors in unconditioned spaces, or inside a wall between a conditioned and unconditioned space.

1. Supply and Return Air:

a. Mineral-Fiber Blanket: 3 inches (50 mm) thick and 0.75-lb/cu. ft. nominal density, FSK jacket.

2. Exhaust ductwork downstream of heat recovery devices including heat recovery chilled water coils and desiccant dehumidification unit regeneration exhaust:

a. Insulate same as insulated supply air ductwork.

END OF SECTION

SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating of above grade HVAC piping.

1.2 ACTION SUBMITTALS

A. Provide submittals for products listed in the Product Table below in accordance with Section 230500 – General HVAC Provisions.

1. Catalog Data.
2. For each type of product listed, provide thermal conductivity and water-vapor permeance.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Insulation materials and accessories shall be installed in a professional manner by skilled and experienced workers who specialize in commercial insulation work.

B. Surface-Burning Characteristics: Products shall have flame spread and smoke developed ratings based on test procedures [and listed and labeled] in accordance with NFPA-255 and UL 723. Rating shall be indicated on the product or on the shipping containers.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 – Hangers and Supports for HVAC Piping and Equipment.

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Mineral-Fiber, Preformed Pipe Insulation:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Johns Manville, a Berkshire Hathaway company

b. Knauf Insulation

c. Manson Insulation Inc.

d. Owens-Corning.

2. Type I, 850°F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

A. Materials 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: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

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 at 43-mil dry film thickness.

2. Service Temperature Range: Minus 20 to plus 180°F.

3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

4. Color: White.

2.4 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-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.5 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.

2. Thickness: 11.5 mils.

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch 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.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 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 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.

C. Install insulation with longitudinal seams at top and bottom of horizontal runs.

D. Install multiple layers of insulation with longitudinal and end seams staggered.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

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. Apply insulation and jacket manufacturer approved adhesives, mastics, and sealants at recommended coverage rate and wet and dry film thicknesses.

J. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches 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.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

N. 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.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.5 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 removable basket flange. 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. 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 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 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.

3.6 INSTALLATION OF MINERAL-FIBER 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 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 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.

C. 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.

3.7 FIELD QUALITY CONTROL

A. Testing: The Owner reserves the right to perform tests and inspections of selected insulation sites.

B. Tests will include removing field-applied jacket and insulation in layers in reverse order of their installation for each piping system scheduled. If testing reveals defective work, all similar insulation sites will be considered defective, and Contractor will be responsible for cost of inspection and repair.

3.8 PIPING INSULATION THICKNESS

A. Serviceable components, connections, and couplings.

1. Install Pre-manufactured Removable Insulation Systems at the following:

a. Valves, manual and automatic.

b. Mechanical couplings requiring access to allow equipment service.

B. Mineral Fiber Insulation

1.

FIBERGLASS					
FLUID NORMAL OPERATING TEMPERATURE (°F)	NOMINAL PIPE OR TUBE SIZE (inches)				
	<1	1 to < 1.5	1.5 to < 4	4 to < 8	>= 8
141-200	1.5	1.5	2	2	2

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.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Heating-Hot-Water Supply and Return: Normal operating temperature range 180°F to 140°F:

1. Mineral Fiber

END OF SECTION

SECTION 23 09 23 - BUILDING AUTOMATION SYSTEMS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Work hereunder includes a complete and operational, fully tested, distributed logic, building automation system (BAS) for control of systems and equipment specified in Division 23. Associated work includes but is not limited to:

1. A network of stand-alone, microprocessor-based building controllers, advanced application controllers, and application specific controllers.
2. Communication, control wiring as required.
3. Building operation and energy management software and related programming including complete licensing agreement for complete use and access of software required for installation, configuration, programming, and operation.
4. Field Mounted Devices as specified in Section 23 09 25 – BAS Field Mounted Devices for HVAC.
5. Control sequences as specified in Section 23 09 29 – BAS Sequence of Operations for HVAC.
6. Other materials and devices not shown as part of other work but necessary to provide mechanical and electrical system control and monitoring sequences specified.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Control Contractor to coordinate with other trades to ensure delivery and correct installation of products furnished but not installed under this section. Coordination to include a review of schedule, manufacturer's installation requirements, and equipment locations. Such products include but are not limited to the following:

1. Control Valves
2. Actuators
3. Terminal Unit Controllers

1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Control Contractor to coordinate with other trades to ensure correct installation and control of products installed but not furnished under this section. Such products include but are not limited to the following:

1. Thermostats furnished with packaged equipment

1.4 RELATED SECTIONS

A. Section 23 09 25 – BAS Field Mounted Devices for HVAC

B. Section 23 09 29 – BAS Sequence of Operations for HVAC

1.5 SUBMITTALS

A. Provide submittals for products listed in the Product Table below in accordance with Section 23 05 00 – General HVAC Provisions. Submittal requirements indicated by column number designation as follows:

1. Materials List

2. Catalog Data
3. Product Data
4. Performance Data
5. Wiring Diagrams
6. Shop Drawings
7. Installation Instructions
8. Special Requirements listed herein.

PRODUCT TABLE	1	2	3	4	5	6	7	8
All Products This Section								X

B. Special Requirements:

1. Provide all control submittals including Sections 23 09 23 – Building Automation Systems for HVAC, 23 09 25 – BAS Field Mounted Devices for HVAC, and 23 09 29 – BAS Sequence of Operations for HVAC as a single package.
2. Submittals prior to starting work:
   a. Submit in accordance with Division 01 and Section 23 05 00 – General HVAC Provisions within 6 weeks of project award.
   b. All required schematics and plans prepared on AutoCAD release 12 or higher.
   c. When manufacturers' product information applies to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the pertinent specification or drawing.
   d. Building Automation System Hardware:
      1) Provide a complete bill of materials of building automation control system hardware indicating quantity, manufacturer, model number, and technical data. Technical data shall include performance curves, product specifications sheets, and installation/maintenance instructions.
      2) Network Communication Diagrams: Provide schematic diagram showing all BAS panels, communications cabling, and termination points. Identify power requirements and power source for each BAS panel. Identify equipment each BAS panel is controlling. Show termination numbers.
      3) Provide plans indicating locations of all BAS hardware.
      4) Provide two copies of programming manuals for each BAS controller furnished.
      5) Provide a listing and description of all available training programs. Indicate a cost for each location that the training program is available.
   e. Controlled Systems:
      1) Provide an instrumentation list for each controlled system including all controlled system elements in table format. Tables to show element name, type of device, manufacturer, model number, and product data sheet number.
      2) Provide a schematic diagram of each controlled system. Include control points labeled with appropriate point names. Graphically show the location of all control elements.
      3) Provide a schematic wiring diagram for each controlled system. Label all elements. Label all terminals.

4) Provide a mounting, wiring, and routing plan-view drawing. Layout to account for HVAC, electrical, and other system design and layout requirements.

5) Provide a complete written sequence of operations for each system or subsystem under all modes of operation. Where Contractor proposes any variation to the sequence of operation described hereunder, the Contractor shall specifically highlight the change and describe the reason for the revision.

6) Provide a points list for each system controller including both input and output (I/O) points. Note point designations, point function, controlled device associated with the I/O point, location of the I/O device, and point alarm requirements.

3. Submittals during construction

a. Database information: Four weeks prior to system start-up, provide two copies of complete database information for Engineer's record. Database information will not be reviewed for conformance with Contract Documents. Database information shall include system configuration parameters, point definitions, alarm and trending parameters, control parameters, and control software programs. Specifically document all control functions that cannot be performed by applications specific controllers using pre-programmed control routines or which must be performed by supervisory control from a general-purpose controller.

b. Graphics: Provide three copies of all proposed graphics screens for review prior to installation. Allow 2 weeks for review.

c. Contractor Verification: Provide Contractor checkout and testing documentation.

4. Closeout Submittals

a. Submit in accordance with Division 01. Submit 10 days prior to final completion for approval.

b. Record documents shall include the following:

1) Project record drawings. Project record drawings will be as-built versions of the shop drawings. Include one set of magnetic media including CAD drawings in .DWG format.

2) Provide copy of testing and commissioning reports. Include trend logs used for verification.

3) Material to be included in Project Operation and Maintenance Manuals

a) Names, addresses and 24-hour telephone numbers of installing Contractors and the service representatives for each.

b) Operator's manual with procedures for operating the control systems including logging on/off, alarm handling, producing point reports, trending data, overriding computer control, and changing set points and other variables.

c) A listing and documentation of all custom software created using the programming language including set points, tuning parameters, and object database.

d) A list of recommended spare parts with part numbers and suppliers.

e) Recommended preventive maintenance procedures for all system components including a schedule of tasks, time between tasks, and task descriptions.

4) Supplemental Record Information

a) Two sets of programming manuals with a description of the programming language (including syntax), statement descriptions (including algorithms and calculations used), point database creation and modification, and use of the program editor.

b) Two sets of engineering, installation, and maintenance manuals explaining how to design and install new points, panels, and other hardware; preventive maintenance procedures; how to debug hardware problems; and how to replace or repair hardware.

c) One set of magnetic/optical media containing backup files of the software and database.

d) One set of magnetic/optical media containing files of all color graphic screens created for the project.

e) One set of complete original issue documentation for third-party software including installation and maintenance instructions.

f) One set of complete original issue diskettes for all operating systems, programming language, operator workstation software, and graphics software.

g) One set of licenses, guarantees, and warranty documents for all system equipment.

1.6 DESIGN REQUIREMENTS

A. BACnet Compliance

1. The BAS shall exchange data between workstations or workstations and building level controllers over the Management Level Network and First-tier BAS Controller Level Network using BACnet Protocol in the form of BACnet objects.

2. The BAS shall perform network functions using the following BACnet services:

a. Alarm and Event

b. Scheduling

c. Trending

d. Network Management

B. Performance Standards:

1. Graphic Display: System shall display a graphic with 20 dynamic points and all current data within 10 seconds.

2. Graphic Refresh: System shall update a graphic with 20 dynamic points and all current data at no greater than 8 second intervals.

3. Object Command: The maximum time between an operator command of a binary object and the reaction of the commanded device shall be 2 seconds. The maximum time between an operator command of an analog object and the start of object adjustment shall be 2 seconds.

4. Object Scan: All changes of state and change of analog values will be transmitted on system communications networks such that any data used or displayed at a controller will have been current within the previous 6 seconds.

5. Alarm Response Time: The maximum time from an object going into alarm-to-alarm annunciation at the workstation shall not exceed 45 seconds.

6. Program Execution Frequency: Custom and standard applications shall be capable of running as often as once every 5 seconds. Contractor shall select execution times consistent with the process under control.

7. Performance: Programmable controllers shall be able to execute BAS PID control loops at a selectable frequency of a least once per second. The controller shall scan and update the process value and output generated at the same frequency.

8. Multiple Alarm Annunciations: All workstations on the network must receive alarms within 5 seconds of each other.

9. Reporting Accuracy: The system shall report all values with an end-to-end accuracy no less than listed in Table 1.

10. Stability of Control: Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

TABLE 1 - REPORTING ACCURACY	
Measured Variable	**Reported Accuracy**
Space Temperature	±1°F
Ducted Air	±1°F
Airflow (terminal)	±10% of full scale *(see Note 1)*
Note 1: 10%-100% of scale	
Note 2: For both absolute and differential pressure	
Note 3: Not including utility-supplied meters	

TABLE 2 - CONTROL STABILITY AND ACCURACY		
Controlled Variable	**Control Accuracy**	**Range of Medium**
Airflow	±10% of full scale	-0.1 to 0.1 in. w.g.
Space Temperature	±2.0°F	
Duct Temperature	±3.0°F	

1.7 QUALITY ASSURANCE

A. All products required to conform to BACnet Standards must be BACnet Testing Laboratory (BTL) listed.

B. All products used in this application, except for those specifically indicated for reuse, shall be new and under current manufacture and shall be the most recent version offered by the manufacturer for the application. Spare parts shall be available from the manufacturer for at least five years after final completion.

C. Control Contractor to have in-house, factory-trained and factory-authorized installers and programmers.

1.8 CODES AND STANDARDS

A. Work, materials, and equipment shall comply with all local, state, and federal codes and ordinances.

B. Each DDCP shall be listed under UL916 (Energy Management Systems), UL864-UDTZ (Signal Systems Unit) and shall be tested to comply with sub-part J of Part 15 FCC rules for Class A computing equipment.

1.9 UPDATES

A. Provide at no extra cost all software and firmware updates that become available from the manufacturer during the warranty period.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Johnson Controls

2.2 COMMUNICATIONS

A. Architecture: Network architecture shall consist of three levels: a management level network, a first-tier controller level, and a second-tier controller level. As an alternative, the management level and first-tier controller levels may be combined into a single level.

1. Management Level Network:

a. The Management Level Network will be used for communications between workstations or workstations and building level controllers.

b. The Management Level Network shall reside on industry standard Ethernet physical link using BACnet communications protocol.

c. The Management Level Network shall operate at a minimum of 2.5 M baud with full peer-to-peer network communication.

2. First-tier BAS Controller Level Network:

a. The first-tier controller level will be used for communications between Building Controllers or Building Controllers and Advanced Application Controllers.

b. The first-tier BAS controller level shall reside on industry standard Ethernet physical link using BACnet communications protocol.

c. The first-tier BAS controller level shall operate at a minimum of 2.5 M baud with full peer-to-peer network communication.

3. Second-tier BAS Controller Level Network:

a. The second-tier BAS controller level will be used for communications between Building Level Controllers, Advanced Application Controllers and Application Specific Controllers.

b. The second-tier BAS controller level shall be performed using peer-to-peer or MS/TP, LonWorks, or other proprietary communications protocols.

c. Second-tier communications shall operate at a minimum speed of 9600 baud.

B. Contractor shall provide all communication media, connectors, repeaters, hubs, and routers necessary for network communications.

C. Communications shall provide operator interface and value passing that is transparent to the system architecture as follows:

1. Connection of an operator interface to any controller on the system will allow the operator to interface with all other controllers as if that controller were directly connected. Data, status information, reports, system software, custom programs, etc., for all controllers shall be available for viewing and editing from any controller on the system.

D. All database values (e.g., objects, software variables, custom programming variables) of any controller shall be readable by any other controller on the system. Value passing shall be automatically performed by a controller when a reference to an object name not located in that

controller is entered into the controller's database. An operator/installer shall not be required to set up any communication services to perform system value passing.

E. The network shall have the following minimum capacity:

1. The first-tier network shall support 50 first-tier controllers.

2. Each first-tier controller shall support 50 second-tier controllers.

3. The entire system shall have the capacity for 12,500 input/output objects associated with first-tier controllers, advanced application controllers, or application specific controllers.

2.3 WORKSTATION GRAPHICS

A. Provide graphics to match existing system.

2.4 SYSTEM CONTROLLERS

A. Application Specific Controllers: Independent, stand-alone microprocessor-based controller to control local equipment or systems where the associated sequence of operation can be met using pre-programmed control routines. Controllers should have the following general characteristics:

1. Sufficient memory in each controller to control the target system.

2. Non-volatile memory to maintain the BIOS and programming information in the event of a power failure.

B. Controller hardware suitable for the anticipated ambient conditions.

1. Controllers used outdoors or in wet conditions mounted in NEMA __ waterproof enclosures rated for operation at –40 degrees F to 150 degrees F.

2. Controllers used in conditioned space mounted in dust-proof enclosures and rated for operation at 32 degrees F to 120 degrees F.

C. Provide diagnostic LEDs for power, communication, and processor. All wiring connections made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.

D. All controllers shall operate at 90% to 110% of nominal voltage and perform an orderly shutdown below 80% nominal voltage. Operation protected against electrical noise at 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.

2.5 INPUT/OUTPUT INTERFACE

A. Hardwire inputs and outputs may connect to the system through a first-tier, advanced application, or application specific controller.

B. All input and output points protected so that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points protected from connected voltage up to 24V of any duration.

C. Binary Inputs: Binary controller inputs shall provide a wetting current of at least 12 mA and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense "dry contact" closure without external power application required.

D. Pulse Accumulation Inputs: In addition to standard binary input characteristics, pulse accumulation inputs shall accept up to 10 pulses per second.

E. Analog Inputs: Analog inputs shall allow the monitoring of low voltage (0 to 10VDC), current (4 to 20 mA), or resistance signals (thermistor or RTD). Analog inputs compatible with commonly available sensing devices.

F. Binary Outputs: Binary outputs to provide on/off control or a pulsed low-voltage signal for pulse-width modulation. Provide three-position (on/off/auto) switch for each output along with indicator light. Output selectable for normally open or normally closed operation.

G. Analog Outputs: Analog outputs to provide a modulating 0 to 10V or 4 to 20 mA signal for control of an end device. Provide two-position (auto/manual) switch, status lights, and manually adjustable potentiometer for each output. Analog output drift less than 0.4% of range per year.

H. Tri-state Outputs: Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point actuators limited to terminal unit and unit ventilator control applications. Control algorithms shall send the actuator to one end of its stroke every 24 hours for verification of operator tracking.

2.6 WIRING AND RACEWAYS

A. Provide wiring, plenum cable, and raceways in accordance with Division 26.

B. All insulated wire to have copper conductor. UL labeled for 90 degree C service.

PART 3 - EXECUTION

3.1 COORDINATION

A. Testing and Balancing

1. Provide to the Testing and Balancing Contractor a set of all tools and temporary licenses necessary to interface to the control system for testing and balancing purposes. Tools to be returned at the completion of test and balancing work.

2. Provide training in the use of the tools.

3. Provide a qualified technician to assist in the testing and balancing process where required.

3.2 WORKMANSHIP

A. Install all equipment in accordance with manufacturers' recommendations.

B. Install equipment, piping, and wiring/raceway parallel to building lines wherever possible.

C. Provide sufficient slack and flexible connections in wiring[**and pneumatic tubing**] to allow for vibration of piping and equipment.

D. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electric Code.

3.3 EXISTING EQUIPMENT

A. Existing Wiring: Contractor may reuse existing wiring provided the quality of the existing installation meets this specification. Verify the integrity of existing wiring or tubing and re-label in accordance with this specification. Remove wiring or tubing abandoned as the result of this work.

B. Local Control Panels: Contractor may reuse existing control cabinets to locate new equipment where existing cabinets are in good condition. Remove all redundant equipment within these cabinets. Patch face cover to fill all holes caused by removal of unused equipment.

C. Unless specifically stated elsewhere, Contractor is not responsible for the repair or replacement of existing control system equipment to be reused. Such equipment includes but is not limited to control devices, valves, dampers, or actuators. Should the Contractor find existing equipment requiring maintenance, Contractor shall notify the Owner immediately. Repair will be performed under separate Contract.

D. Room Thermostats or Sensors: Remove and become property of the Contractor.

E. Control Valves and Actuators: Salvage, recondition, and reuse.

3.4 GENERAL WIRING

A. All control and interlock wiring shall comply with national and electrical codes and Division 26. Where requirements of this section differ from those in Division 26, the requirements of this section shall take precedence.

B. All low-voltage wiring shall meet NEC Class or Class 2 requirements. Low voltage power circuits shall be sub-fused when required.

C. Where NEC Class 1 and Class 2 wires are in concealed and accessible locations, including ceiling plenum return air plenums, approved cable not in raceway may be used provided cables are UL listed for the intended application.

D. All wiring in mechanical, electrical, or service rooms and wiring located where it may be subject to damage shall be installed in raceway.

E. Do not install Class 2 wiring in raceways containing Class 1 wiring. Boxes and panels containing high-voltage wiring may not be used for low-voltage wiring except for the purpose of interfacing the two.

F. Where plenum cables are used without raceway, support or anchor cable from building structure. Do not anchor or support cable from ductwork, electrical raceways, piping, or suspended ceiling systems.

G. Provide all wire-to-device connections at terminal block or terminal strip. Provide all wire-to-wire connections at terminal block.

H. Neatly bundle wiring located within enclosures to permit access to devices and terminals.

I. Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, Contractor shall provide a step-down transformer.

J. All wiring shall be installed as continuous lengths with no splices permitted between termination points.

K. Install plenum wiring in sleeves where it passes through walls and floors. Provide firestop foam where necessary to maintain fire rating.

L. Provide size of raceway and size and type of wire as required by NEC and as required to meet manufacturers' recommendations for connected equipment.

M. Include one pull string in each raceway 1-inch or larger.

N. Use color coded conductors throughout.

O. Locate control and status relays in designated enclosures only. Such enclosures include packaged equipment control cabinets unless such cabinets also contain Class 1 starters.

P. Conceal all raceways except within mechanical, electrical, or service rooms. Maintain minimum raceway clearance of 6-inches from high temperature equipment such as steam piping or boiler flues.

Q. Secure raceways with raceway clamps fastened to the structure and spaced in accordance with code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be supported from ductwork, electrical raceways, piping, or suspended ceiling systems.

R. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all raceways.

S. Maintain updated wiring diagrams (as built) at site with terminations identified.

T. Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 3-feet in length and shall be supported at both ends. Flexible metal raceway less than ½-inch electrical trade size

shall not be used. In areas exposed to moisture, including but not limited to chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.

3.5 COMMUNICATION WIRING

A. Install in accordance with 3.03 above.

B. Follow manufacturers' recommendations for all communications cabling including but not limited to maximum pulling, tension, and bend radius.

C. Do not install communications cabling in a raceway or enclosure containing Class 1 or other Class 2 wiring.

D. Verify the integrity of the entire network immediately following cable installation using test measures appropriate for each cable.

E. Provide a lightning arrestor between cables and grounds where cable enters or exits a building. Install arrestor in accordance with manufacturers' recommendations.

F. All communications wiring shall be un-spliced length when that length is commercially available.

G. All communications wiring shall be labeled to indicate origination and destination.

H. Ground coaxial cable in accordance with NEC regulations article on "Communications Circuits, Cable and Protector Grounding."

3.6 IDENTIFICATION OF HARDWARE AND WIRING

A. Label all wiring and cabling, including wiring and cabling terminating within factory-fabricated panels, within 2 inches of termination with the BAS address or termination number.

B. [Label all pneumatic tubing at each end within 2 inches of termination with a descriptive identifier.]

C. Permanently label or code each point of field terminal strips to show the instrument or item served.

D. Identify control panels with minimum ½-inch letters on laminated plastic nameplate.

E. Identify all other control components with permanent labels. All plug-in components shall be labeled so that removal of component does not remove label.

F. Identify room sensors relating to terminal box or valves with nameplate located within sensor cover.

G. Arrange components so that UL or CSA labels are visible after equipment is installed.

H. Identifiers shall match record documents.

I. Provide laminated network communication diagrams, point-to-point wiring diagrams, and process control diagrams in each control panel for control components contained therein.

3.7 BAS CONTROLLER INSTALLATION

A. Provide sufficient internal memory for the specified sequences of operation and trend logging. Provide a minimum of 25% available memory free for future use.

3.8 PROGRAMMING

A. Provide programming for the system as required to perform the sequence of operation. See Section 23 09 29 – BAS Sequence of Operations for HVAC. Provide all other programming necessary for proper operation of the system but not specified including but not limited to time delays, control deadbands, equipment interlocks, equipment sequencing, alarm notification, and control sequences recommended by equipment manufacturers.

B. All control setpoints and loop tuning parameters accessible for review and adjustment at workstation graphics or through workstation menus without requiring modification of program code.

C. For systems using text-based programming, imbed comments in the programming code to clearly describe each section of the program.

D. Contractor to provide time scheduling functions as specified in the Sequence of Operations. Independent schedules shall be provided for each system, unless otherwise specified.

E. Contractor to provide alarming functions as specified in the Sequence of Operations. Contractor shall also configure alarming functions as directed by Owner including setting alarm limits and differentials, states, type of notification, and alarm messages.

F. Contractor shall configure trending functions as directed by Owner including trend data collection and report format.

3.9 CONTROL SYSTEM CHECKOUT AND TESTING

A. Contractor shall completely test and verify specified control system performance. Compile test results and include with written certification.

B. Contractor shall furnish all labor and test apparatus required to calibrate and prepare for service all instruments, controls, and accessory equipment furnished hereunder.

C. Contractor shall perform the following testing and verification

1. Verify that all control and communications wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

2. Enable control systems and verify instrument calibration and end-to-end reporting accuracy of all input devices individually. Perform calibration in accordance with manufacturers' recommendations. Repair or replace all temperature sensors requiring a calibration offset greater than +/- 1°F.

3. Verify control stability and end-to-end reporting requirements are met.

4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that normal positions are correct.

5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, start/stop and span are correct, and direction and normal position are correct.

6. Verify that system operation complies with the sequence of operations. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all BAS control loops and optimum start/stop routines.

7. Alarms and Interlocks:

a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.

b. Trip interlocks using field contacts to check the logic and ensure that the fail-safe condition for all actuators is in the proper direction.

c. Test interlock actions by simulating alarm conditions to check the initiating value of the variable and the interlock action.

D. Contractor shall maintain the following documentation:

1. Calibration log including date, time, control system readout, means of verification, verification measurement, and required calibration offset for each analog input.

2. BAS Loop Response: Supply trend data output in graphical form showing the step response of each BAS loop. The test shall show the loop's response to a change in set- point requiring

a change in actuator position of at least 25% of full range. Provide sampling rate from 10 seconds to 1 minute depending on loop speed. Trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Contractor shall retune any loop that indicates unreasonably under-damped or over-damped control.

3. Demand Limiting: Supply trend data showing the action of any demand limiting functions. Document operation at maximum one-minute intervals for at least 30 minutes.

4. Operational Logs: Provide operational trend logs for each system indicating setpoints, operating points, valve positions, mode, and equipment status. Logs shall cover three 48-hour periods and have a sample frequency of not more than 5 minutes. Logs provided in both printed and disk formats.

E. After system operation is completely verified, provide written certification to Owner that systems have been fully tested and are operating according to specifications and ready for functional testing. Provide copies of documentation signed by person performing tests. Documentation to include:

1. Calibration logs

2. BAS Loop Response Trends

3. Demand Limiting Trends

4. Operational Logs

3.10 DEMONSTRATION AND ACCEPTANCE

A. Demonstrate operation of control system to Owner and Engineer including:

1. Menu functions

2. Point overrides

3. Control loop response after point modification

4. Alarm response time

3.11 TRAINING

A. Provide a minimum of 24 hours training to Owner's personnel in use and maintenance of BAS building management and control hardware and software. Training shall be provided in two (2) sessions of 8 hours each and two (2) sessions of 4 hours each as follows:

1. The first session shall provide system overview and training on log on procedures, data access and display, alarm and status descriptions, log requests, execution of commands, and other general system operation procedures.

2. The second session shall include instruction on system maintenance procedures. Procedures reviewed will include day-to-day system maintenance requirements, calibration techniques and diagnosis of system failures. Diagnosis procedures shall include instructions to follow in the event of failure of each control sub-system or device.

3. Two remaining sessions shall include instruction on site-specific programs, graphics, and user interfaces.

B. Manufacturers Training: Provide 2-hour manufacturer training course for 3 Owner’s Representatives. Training shall be provided on a variety of topic as selected by the Owner. Training shall be performed at manufacturer’s designated locations.

END OF SECTION

SECTION 23 09 25 - BAS FIELD-MOUNTED DEVICES FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Temperature instruments
2. Control Valves
3. Control Dampers

B. Related Requirements:

1. Section 230910 – Building Automation Systems
2. Section 230990 – Building Automation System Sequence of Operations

1.2 DEFINITIONS

A. BAS: Building Automation System

B. Cv: Design valve coefficient.

C. HART: Highway Addressable Remote Transducer Protocol

D. NBR: Nitrile butadiene rubber.

E. PTFE: Polytetrafluoroethylene.

F. RTD: Resistance temperature detector.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation operation and maintenance instructions, including factors affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Include details of product 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. Include number-coded identification system for unique identification of wiring, cable, and tubing ends.

C. Schedule and design calculations for control valves and actuators, including the following:

1. Flow at project design and minimum flow conditions.
2. Pressure differential drop across valve at project design flow condition.
3. Maximum system pressure differential drop (pump close-off pressure) across valve at project minimum flow condition.
4. Design and minimum control valve coefficient with corresponding valve position.
5. Maximum close-off pressure.
6. Leakage flow at maximum system pressure differential.
7. Torque required at worst case condition for sizing actuator.
8. Actuator selection indicating torque provided.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each product requiring a certificate.

B. Product Test Reports: For each product, for tests performed by [manufacturer and witnessed by a qualified testing agency] [a qualified testing agency].

C. BAS Configuration Data: Provide configuration data necessary for programming conversion of analogy output signals to accurately indicate measured values. Calibration data shall be specific to the measurement device installed.

D. Field quality-control reports.

E. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Control valve installation location shown in relationship to room, duct, pipe, and equipment.
2. Size and location of wall access panels for control valves installed behind walls.
3. Size and location of ceiling access panels for control valves installed above inaccessible ceilings.
4. Location of occupancy sensors. Indicate occupancy sensors and lighting control devices used for HVAC control.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. BAS Configuration Data: Copy of analog input configuration data using for programming BAS.
2. Control Valves: Operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

D. Environmental Conditions:

1. Instruments shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.

a. If instrument alone cannot meet requirement, install instrument in a protective enclosure that is isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated[**and cooled**], filtered, and ventilated as required by instrument and application.

E. Control Valve Selection Criteria:

1. Control valves shall be suitable for operation at following conditions:

a. Heating Water: 175 psi maximum working pressure and 220 degree F, except where otherwise indicated.

2. Shutoff Characteristics: Control valve shutoff classifications shall be FCI 70-2, Class IV or better unless otherwise indicated.

3. Configuration and Flow Characteristics:

a. Valve pattern, three-way or straight through, shall be as indicated on Drawings.

b. Modulating two-way straight-through pattern control valves shall have equal percentage flow-throttling characteristics unless otherwise indicated.

c. In water systems, use ball-style control valves for two-position and modulating control for valves NPS 2-1/2 and smaller and butterfly style for valves NPS 3 and larger.

4. Valve Sizing

a. Water systems, modulating:

1) Select valves at terminal equipment including terminal unit coils for a design Cv based on a pressure drop of 3 psig at design flow unless otherwise indicated.

b. Two-position control valves: line size unless otherwise indicated.

5. Fail positions unless otherwise indicated:

a. Heating Hot Water: Last position.

6. Valves shall have stable operation throughout full range of operation, from design to minimum Cv.

a. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.

7. Selection shall consider viscosity, flashing, and cavitation corrections.

2.2 TEMPERATURE SENSORS, TRANSMITTERS, AND SWITCHES

A. Air Thermistor Sensor:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Building Automation Products, Inc. (BAPI)

b. Greystone Energy Inc.

c. Schneider Electric.

d. Vaisala

e. Veris Industries

f. Approved BAS System Manufacturer

2. Sensor

a. 10,000 ohms at 25 deg C and a temperature coefficient of 23.5 ohms/ohm/deg C.

b. Two-wire, PTFE-insulated, 22-gage stranded copper leads.

c. Performance Characteristics:

1) Probe Range: Minus 40 to 220 deg F

2) Interchangeable Accuracy: At 77 deg F within 0.5 deg F.

3) Repeatability: Within 0.5 deg F.

4) Drift: Within 0.5 deg F over 10 years.

5) Self-Heating: Negligible.

3. Single-Point Duct Air Temperature Sensors:

a. Probe: Single-point sensor with a stainless-steel sheath.

b. Length: As required by application to achieve tip at midpoint of air tunnel, up to 18 inches.

c. Gasket for attachment to duct or equipment to seal penetration airtight.

4. Averaging Air Temperature Sensors:

a. Multiple sensors to provide average temperature across entire length of sensor.

b. Flexible probe of aluminum, brass, copper, or stainless-steel sheath and formable to a 4-inch radius.

c. Length: As required by application to cover entire cross section of air tunnel.

d. Gasket for attachment to duct or equipment to seal penetration airtight.

5. Ceiling Probe Temperature Sensors:

a. White, ABS plastic probe, 4-inch length.

6. Space Air Temperature Sensors:

a. Temperature Range: Minus 50 to 120 deg F

b. Sensor assembly shall include a temperature sensing element mounted under a bright white, non-yellowing, plastic, except flush, brushed-aluminum cover in the following locations:

1) Locations subject to physical damage: flush, brushed-aluminum or stainless steel

2) Washdown rated spaces: flush, brushed-aluminum, or stainless steel

c. Provide a mounting plate that is compatible with the surface shape that it is mounted to and electrical box used.

d. Concealed wiring connection.

7. Space Air Temperature Sensors Used for Controlling Terminal Units, Additional Requirements:

a. Provide digital display of sensed temperature.

b. Provide sensor with local control.

1) Local override to turn HVAC on.

2) Local adjustment of temperature set point.

3) Both features shall be capable of manual override through control system operator.

8. Accessories

a. Gasket for attachment to duct or equipment to seal penetration airtight.

2.3 CONTROL VALVES

A. Ball Control Valves

1. Commercial-Grade, Two-Way and Three-Way:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Belimo, Inc.

2) Johnson Controls, Inc.

3) Siemens Industry, Inc., Building Technologies Division.

b. Pressure Rating: 400 WOG.

c. Process Temperature Range: Zero to 212 deg F.

d. Body and Tail Piece: Cast bronze ASTM B 61, ASTM B 62, ASTM B 584, or forged brass with nickel plating.

e. End Connections: Threaded.

f. Ball: 300 series stainless steel.

g. Stem and Stem Extension:

1) Material to match ball.

2) Blowout-proof design.

3) Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.

h. Ball Seats: Reinforced PTFE.

i. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed or EPDM O-ring.

j. Performance:

1) Maximum Shutoff Pressure: 200 psig

2) Maximum Differential Pressure: 50 psi

3) Rangeability: 100 to 1.

4) Leakage: FCI 70-2, Class IV.

k. Flow Characteristic:

1) 2-way: Equal percentage.

2.4 CONTROL VALVE AND DAMPER ACUATORS

A. Subject to compliance with requirements, provide products by one of the following:

1. Belimo, Inc.
2. Honeywell International, Inc.
3. Johnson Controls, Inc.
4. Siemens Industry, Inc., Building Technologies Division.

B. Performance

1. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
2. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.
3. Actuators for Steam Control Valves: Shutoff against 1.5 times steam design pressure.
4. Actuators for Control Dampers: Capable of closing valve against system fan maximum static pressure that can be developed by fan.
5. Actuator operating speed shall provide response required for the intended control function and be compatible with equipment and system operation.
6. Maximum sound level: 65 dBa

C. Type: Motor operated, with or without gears, electric and electronic.

D. Voltage: Voltage selection delegated to professional designing control system, unless otherwise indicated.

E. Position indicator and graduated scale on each actuator.

F. Construction:

1. For Actuators Less Than 100W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.

G. Field Adjustment:

1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.
2. Gear Type Actuators:
    a. External manual adjustment mechanism to allow manual positioning when the actuator is not powered.
    b. Adjustable mechanical end stops.

H. Two-Position Actuators: Single direction, spring return.

I. Modulating Actuators:

1. Operation: Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:
    a. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10- or 2- to 10-V dc and 4- to 20-mA signals.
    b. Programmable Multi-Function:
        1) Control Input, Position Feedback, and Running Time: Factory or field programmable.

2) Diagnostic: Feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.

3) Service Data: Include, at a minimum, number of hours powered and number of hours in motion.

J. Position Feedback:

1. Where required, equip two position actuators with adjustable limits switches or other positive means of a position indication signal for remote monitoring of open and close position.

2. Where required, equip modulating actuators with a position feedback through current or voltage signal for remote monitoring.

3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

K. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.

2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

L. Valve Attachment:

1. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.

2. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.

3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

M. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.

2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

N. Enclosure:

1. Suitable for ambient conditions encountered by application.

2. NEMA 250, Type 2 for indoor and protected applications.

3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.

4. Provide actuator enclosure with heater and control where required by application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation. Verify that the proposed mounting locations comply with manufacturers recommendations and requirements indicated and approved submittals.

C. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation. Verify that the proposed mounting locations comply with manufacturers recommendations and requirements indicated and approved submittals.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Temperature Instruments

1. Air Temperature Sensors and Transmitters:

a. Space: Air Thermistor Sensor.

B. Control Valves

1. Select from valves specified in "Performance Requirements, Control Valve Selection Criteria" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.

2. Control valves shall be two-way commercial-grade.

3.3 INSTALLATION

A. General

1. Install products level, plumb, parallel, and perpendicular with building construction.

2. Properly support instruments, tubing, piping, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment.

3. Provide ceiling, floor, roof, wall openings, and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

4. Fastening Hardware:

a. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.

b. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.

5. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

6. Mounting Height:

a. Mount instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.

b. Mount switches and transmitters, located in mechanical equipment rooms and other similar space not subject to code, state, and federal accessibility requirements at 60 inches above the adjacent floor, grade, or service catwalk or platform.

7. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static-pressure class.

B. Temperature Instruments

1. Mounting Location:

a. Roughing In:

1) Outline instrument mounting locations before setting instruments and routing cable, wiring, tubing, and conduit to final location.

2) Provide independent inspection to confirm that proposed mounting locations comply with requirements indicated and approved submittals.

a) Indicate dimensioned locations with mounting height for all surface-mounted products on Shop Drawings.

b) Do not begin installation without submittal approval of mounting location.

3) Complete installation rough-in only after confirmation by independent inspection is complete and approval of location is documented for review by Owner's Authorized Representative.

b. Install switches and transmitters for air and liquid temperature associated with individual air-handling units and associated connected ductwork and piping near air-handling units co-located in air-handling unit system control panel to provide service personnel a single and convenient location for inspection and service.

c. Install temperature switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings or approved by the Owner's Authorized Representative.

d. Mount switches and transmitters on walls, floor-supported freestanding pipe stands, or floor-supported structural support frames. Use manufacturer's mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.

2. Space Temperature Sensor Installation:

a. Conceal assembly in an electrical box of sufficient size to house sensor and transmitter, if provided.

b. Install electrical box with a faceplate to match sensor cover if sensor cover does not completely cover electrical box.

c. In finished areas, recess electrical box within wall.

d. In unfinished areas, electrical box may be surface mounted if electrical light switches are surface mounted. Use a cast-aluminum electric box for surface-mounted installations.

e. Align electrical box with other electrical devices such as visual alarms and light switches located in the vicinity to provide a neat and well-thought-out arrangement. Where possible, align in both horizontal and vertical axis.

3. Single-Point Duct Temperature Sensor Installation:

a. Install single-point-type, duct-mounted, supply- and return-air temperature sensors. Install sensors in ducts with sensitive portion of the element installed in center of duct cross section and located to sense near average temperature. Do not exceed 24 inches in sensor length.

b. Install return-air sensor in location that senses return-air temperature without influence from outdoor or mixed air.

c. Rigidly support sensor to duct and seal penetration airtight.

d. If required to have transmitter, mount transmitter remote from sensor at accessible and serviceable location.

C. Control Valves

1. Install pipe reducers for valves smaller than line size. Position reducers as close to valve as possible but at distance to avoid interference and impact to performance. Install with manufacturer-recommended clearance.

a. Install flanges or unions to allow drop-in and -out valve installation.

2. Valve Orientation:

a. Where possible, install globe and ball valves installed in horizontal piping with stems upright and not more than 15 degrees off of vertical, not inverted.

b. Install valves in a position to allow full stem movement.

3. Clearance:

a. Locate valves for easy access.

b. Install valves with at least 12 inches of clear space around valve and between valves and adjacent surfaces.

3.4 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 – Enclosed Switches and Circuit Breakers.

C. Furnish and install power wiring. Comply with requirements in 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

D. Furnish and install raceways. Comply with requirements in 26 05 33 - Raceways and Boxes for Electrical Systems.

3.5 IDENTIFICATION

A. Identify control components and piping. Comply with 23 05 53 - Identification for VAC Piping and Equipment.

B. Identify system electrical components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 - Identification for Electrical Systems.

3.6 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

3.7 ADJUSTMENT, CALIBRATION, AND TESTING

A. Description:

1. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.

2. Equipment and procedures used for calibration shall meet instrument manufacturer's written instructions.

3. Provide diagnostic and test equipment for calibration and adjustment.

4. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.
5. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.
6. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.
7. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements and to supplement requirements indicated.

END OF SECTION

SECTION 23 09 29 - BAS SEQUENCE OF OPERATIONS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Provide custom engineered BAS operating software to perform control sequences specified.

1. Sequence of operations describes major control functions but does not limit Contractor's responsibility to provide a fully operational automatic control system. Contractor shall provide additional control functions not specifically described herein including time delays, control deadbands, equipment interlocks, equipment sequencing, alarm notification, control functions recommended by equipment manufacturers, or as otherwise required.

2. The control system shall include of all necessary devices and software to provide the sequences of operation described herein.

1.2 DEFINITIONS

A. BAS: Building Automation System.

B. EC: Electrical Contractor.

1.3 SUBMITTALS

A. Provide Action Submittals, Informational Submittals, and Close-out Submittals. Refer to 23 09 23 - Building Automation Systems for HVAC.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Control Programming

1. Control setpoints and parameters listed in control sequences are initial values. Adjust setpoints and control parameters as required to achieved desired environment conditions, optimum system performance, and as recommended by the TAB contractor and/or Commissioning Agent.

2. Control parameters and setpoints listed in the sequence of operations shall be adjustable from the Operator Workstation without modification of control programming or use of proprietary software. All setpoints which are necessary for normal operation and optimization of system performance shall be adjustable, and shall include, but not be limited to: time schedules; temperature, pressure, humidity, and CO2 setpoints; time delay settings; safety sequence setpoints; and alarming parameters.

B. BAS Points List

1. Provide all control points required to perform the automatic control sequence described herein, which as a minimum shall include all points listed in BAS Points List scheduled on mechanical and plumbing drawings.

2. Point Communication: All points listed are to be hardwired to BAS controllers, except where point is identified as being communicated over a BAS network.

a. PTP = Hardwired point-to-point

b. C = BAS network communication

3. Point Source: All points shall be connected to field-mounted control devices, except where the point is identified as being obtained from an equipment controller identified. See

Drawing Legend or equipment schedules for designation of equipment control panel abbreviations.

C. Control Network Integration

1. Where BAS network communications are integrated with networkable control equipment controllers or compatible control systems, Contractor shall configure accessible points for control, monitoring, and alarm as required to provide specified sequences and as directed by the Owner's Authorized Representative for trending and monitoring.

2.2 TERMINAL UNITS

A. Type A: Variable volume single duct unit with hot water reheat.

1. Operation Modes: Operate terminal unit subject to associated air handling system operating modes.

2. Occupied Period Control: Control terminal units as follows during scheduled occupied periods

a. Cooling Mode: Reheat valve closed. Modulate air damper to maintain occupied cooling space temperature setpoint. At maximum cooling demand, modulate air damper to maintain maximum cooling airflow setpoint. As cooling demand decreases reduce primary airflow. With no cooling or heating demand, modulate primary air damper to maintain minimum cooling airflow setpoint with reheat valve closed.

b. Heating Mode: Modulate reheat coil control valve output to maintain space temperature setpoint. Modulate air damper to maintain minimum cooling airflow setpoint. Reset SAT to maintain space temperature.

3. Unoccupied Period Control: Control terminal units as follows during scheduled unoccupied periods.

a. Close terminal unit reheat valve off during unoccupied periods, except during warm-up and night-low-limit modes.

b. Warm-up Mode Control: Operate in accordance with Occupied Period Control

c. Warm-up Mode Control and Night-Low-Limit Control.

1) Set maximum heating airflow setpoint to equal normal maximum cooling setpoint.

2) Modulate heating valve to maintain occupied heating setpoint.

2.3 EXISTING HVAC SYSTEM TO REMAIN

A. General: Building Automation control, Building Automation control, monitoring and alarm systems operate systems, equipment, and functions associated with areas of the building that will remain in use and must remain operational throughout the duration of the project.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install complete control system including all components, devices, and accessories required to perform specification sequence of operation and provide intended system performance.

END OF SECTION

SECTION 23 21 13 - ABOVE GROUND HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes pipe, fittings, and joining methods for HVAC systems.

1.2 PERFORMANCE REQUIREMENTS

A. All hydronic piping, equipment, fittings, and accessories shall be capable of withstanding the following maximum pressure and temperature. Exceptions would include specific items of equipment where a lower operating pressure is specified.

1. Hot-Water Heating Piping:

a. Maximum operating pressure: 125 psig.

b. Maximum operating temperature: 200°F.

1.3 ACTION SUBMITTALS

A. Provide materials list for pipe and fittings.

B. Provide catalog data for dielectric fittings.

1.4 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

B. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Drawn-Temper Copper Tubing: ASTM B 88, Type M.

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Wrought-Copper Fittings: ASME B16.22.

E. Wrought-Copper Unions: ASME B16.22.

2.2 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

2.3 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Watts, a Watts Water Technologies company

b. Wilkins

2. Description:

a. Standard: ASSE 1079.

b. Pressure Rating: 125 psig minimum at 180°F, 150 psig.

c. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Above ground hot-water heating piping, NPS 2and smaller, shall be the following:

1. Type L drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains at supply connection to each piece of equipment, and where shown on drawings.

B. Install control valves according with manufacturer’s instructions. Verify control valve port arrangement provides the intended function. Notify Engineer of any potential conflict between valve arrangement shown on plans and control valve installation requirements prior installing valves. Any control valves installed with incorrect connections will be re-piped to provide correct function at no expense to the Owner.

3.3 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 by Engineer.

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 ¾ball valve, and short NPS ¾threaded nipple with cap, at low points in piping system mains and elsewhere as required for complete 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 unions in piping, NPS 2and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install strainers on inlet side of each control valve and elsewhere as indicated.

R. Flexible Mechanical Coupling Connectors: Refer to 23 21 16 - Hydronic Piping Specialties for installation requirements.

S. Flush and fill systems with fluid.

T. Provide temporary facilities required for cleaning and treatment of piping connected to existing hydronic systems:

1. Provide temporary recirculation bypass assembly including:

a. Shutoff valves to isolates new work from existing system.

b. Temporary recirculation pipe connections with shutoff valves and caps.

c. Bypass piping with isolation valve to enable circulation in new section of piping.

d. Drain valves as required.

e. Coordinate with treatment specialist. Refer to 23 25 13 - Water Treatment for Hydronic Systems.

3.4 CONNECTION BETWEEN DISSIMILAR METALS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: [Use dielectric unions.] [or] [Provide screwed brass union or screwed brass valve where dissimilar metals meet.]

3.5 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 – Hangers and Supports for HVAC Piping and Equipment for hanger, support, and anchor devices.

3.6 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to 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. Repeat process until systems are clean and no debris is found in fluid or strainer screens.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve.

5. Install safety 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. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not 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 "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

4. 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.

5. 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 hydronic piping applications.

1.2 ACTION SUBMITTALS

A. Provide submittals for products listed in the Product Table below in accordance with Section 230500 – General HVAC Provisions. Submittal requirements indicated by column number designation as follows:

1. Materials List
2. Catalog Data
3. Product Data
4. Performance Data
5. Wiring Diagrams
6. Shop Drawings
7. Installation Instructions
8. Special Requirement listed herein.

PRODUCT TABLE	1	2	3	4	5	6	7	8
Consolidated Fittings	X		X	X			X	
Air Control Devices		X						
Strainers		X						

B. Special Requirements

1. Balancing Devices: Provide instrument schedule listing each balancing device furnished along with model number, line size, design flow, permanent pressure drop, and measurement differential pressure at design flow.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 CONSOLIDATED FITTINGS

A. Acceptable Manufacturers:

1. Griswold Controls
2. Hays Fluid Controls
3. IMI Flow Design
4. NuTech Hydronic Specialty Products
5. Pro Hydronic Specialties

B. Hydronic Coil Arrangement, 2-way:

1. Supply Fitting: Fitting assembly consisting of a ball valve, wye strainer, pressure/temperature tap, and union.
2. Return Fitting. Fitting assembly consisting of a ball valve, venturi with two pressure/temperature taps arranged to measure water flow rate, and union.

C. Components:

1. Ball Valve: Brass body, chrome-plated or stainless-steel ball, Teflon seals, full port, 400 psig working pressure. Adjustable memory stops.
2. Wye Strainer: Cast brass construction, 20 mesh stainless steel screen.
3. Pressure/Temperature Taps: 1/4-inch NPT, solid brass, 1/8-inch probe diameter. Nordel seal for maximum 275°F service. Cap with gasket.
4. Venturi: One-piece, non-ferrous bronze/brass venturi. High/low signal, +/- 3% accuracy full scale overflow. Flow ranges from 0.2 gpm to 40 gpm.

D. Accessories:

1. Coil Connection Hose Kit: Flame retardant, EPDM core, Stainless steel braided hose. Provide for coil connection applications. Not required for chilled beam zone stations.
    a. Length: ½ inch to ¾ inch diameter: 18 inches

2.2 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. AMTROL, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett; a Xylem brand.
    d. Nexus Valve, Inc.
2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225F.

2.3 STRAINERS

A. Y-Pattern Strainers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Armstrong.
    b. Mueller Steam Specialty.
    c. Spirax Sarco,
    d. Watts.

2. Body: Bolted cover and threaded bottom blowoff outlet connection.
    a. Steel Piping System: ASTM A 126, Class B, cast iron.
    b. Copper Piping Systems: Bronze
3. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
4. Screen:
    a. Free area of strainer element no less than four times the pipe cross sectional area.
    b. Material
        1) Closed, chemically treated hydronic systems: Stainless-steel.
        2) Open or non-chemically treated hydronic systems: Brass
    c. Size
        1) 2-inch and Smaller: 20 mesh
        2) 2-1/2 inch to 4-inch: 1/16-inch perforations
        3) 5-inch and Larger: 1/8-inch perforations.
5. CWP Rating: 125 psig.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's recommendations.

B. Consolidated Fittings: Install so temperature probe and pressure gauge probe can easily be inserted and removed with no obstruction.

C. Air Vents
1. Install manual air vents at all other high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
2. Provide isolation valve at each air vent.

D. Y-Pattern Strainers
1. Locate where shown on drawings and ahead of reducing valves, automatic control valves, and pumps.
2. Arrange for easy access.
3. Provide ball valve with hose end connection on blowoff outlet of hydronic system strainers two inches and larger.
4. Provide globe valve on blowoff outlet of steam system strainers.
5. Provide pressure gauges on strainers 4-inch and larger. Pipe to strainer inlet and outlet. Provide ball valve at each connection.

3.2 APPLICATION

A. Consolidated fittings: Provide consolidated fittings sized as listed below regardless of pipe size shown on drawings. Where pipes size listed on drawings is different than listed provide fittings to accommodate changes in pipe size. Sized fittings based on the scheduled equipment flow rates as follows:
1. ½ inch: 0.5-0.5 gpm

2. ¾ inch: 0.5-3.0 gpm

B. Connectors: Provide where flexible pipe connections are shown on drawings or as otherwise

END OF SECTION

SECTION 23 31 13 - METAL DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes metal ductwork, liner, and related fittings and sealants.

1.2 PERFORMANCE REQUIREMENTS

A. 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 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"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. See Section 230500 for general submittal requirements.

B. Materials List:

1. Shop fabricated ductwork:

C. Catalog Data:

1. Pre-manufactured Ductwork and Fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

B. Comply with applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Ductwork Dimensions: Ductwork dimensions shown on drawings are internal dimensions.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support

intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Sealing Requirements:

1. Concealed: Seal longitudinal seams and transverse joints with liquid duct sealer or tape-and-adhesive. Flanged, gasketed joints that meet seal requirements do not require separate duct sealant application.

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. General: Round ductwork may be either shop or factory fabricated. Flat-oval ductwork shall be factory fabricated.

C. Manufacturers: Subject to compliance with requirements, available manufacturers offering factory fabricated products that may be incorporated into the Work include, but are not limited to the following:

1. McGill AirFlow LLC.
2. MKT Metal Manufacturing.
3. Sheet Metal Connectors, Inc.
4. Spiral Manufacturing Co., Inc.

D. 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 in Diameter: Flanged.

E. 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."

F. 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."

G. Sealing Requirements:

1. Concealed: Flanged, gasketed joints that meet seal requirements do not require separate duct sealant application.
2. Exposed: Seal non-flanged transverse joints with liquid duct sealer, specified herein, applied to male end fittings only, so that sealer is not visible when joint is assembled.

2.4 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: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

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.

2.5 DUCT LINER

A. Flexible (Type I) or Rigid (Type II) Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Knauf Insulation.
    d. Owens Corning.
2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
    a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel to match duct material; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Where multiple layers are required to obtain indicated thickness, provide inner perforated sheet metal duct.

2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

3. Butt transverse joints without gaps, and coat joint with adhesive.

4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.

6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

7. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries

2. McGill AirSeal LLC.

3. Carlisle HVAC Products

B. 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.

C. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

2. Tape Width: 4 inches.

3. Sealant: Modified styrene acrylic.

4. Water resistant.

5. Mold and mildew resistant.

6. Maximum Static-Pressure Class: 10-inch w.g., positive and negative.

7. Service: Indoor and outdoor.

8. Service Temperature: Minus 40 to plus 200 deg F.

9. Substrate: Compatible with galvanized sheet steel.

10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. 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 w.g., positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel

E. 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.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

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 by Engineer.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval 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, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

3.2 DUCT SEALING

A. Provide Seal Class in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible,"

B. Clean duct surfaces prior to applying sealant.

C. Prior to application, verify that ducts are dry and within specified temperature limits.

D. Open ends of completed and overnight work-in-progress shall be sealed.

3.3 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 thick.

4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

5. Do not use powder-actuated concrete fasteners for seismic restraints.

6. Confirm design of existing concrete slabs prior to installing fasteners. Where existing slabs contain embedded components such as tension cables. Locate embedded components and install fasteners to so that embedded components remain undamaged.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches 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 interval of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 – Air Duct Accessories.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 START UP

A. Air Balance: Comply with requirements in Section 230593 – Testing, Adjusting, and Balancing for HVAC.

3.6 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel.

B. Pressure Class

1. 2-inch minimum.

2. Ductwork connected to fan discharge shall be rated for positive pressure.

C. Seal Class

1. Seal Class depending on Pressure Class in accordance with SMACNA’s “ HVAC Duct Construction Standards – Metal and Flexible except as otherwise indicated.

D. Leakage Class

1. Leakage Class as required to meet recommended maximum leakage percentages as tabulated in ASHRAE Handbook “ HVAC Systems and Equipment -2012, Chapter 19, Table 2

E. All ductwork single wall.

F. Supply Ducts:

1. Ducts Connected to Terminal Units:

a. Pressure Class: Positive 1-inch w.g.

G. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Single wall.

b. Pressure Class: Positive or negative 2-inch w.g.

H. Intermediate Reinforcement: Match duct material.

I. Liner Schedule: Schedule applies to both single and double wall duct systems.

1. Return Air Ducts: Fibrous glass, Type I.

a. Conditioned: 1 inch thick.

2. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.

J. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 800 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.

2) Mitered Type RE 4 without vanes.

b. Velocity 800 to 1500 fpm:

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 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. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.

2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.

3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

b. Construction:

1) Round Elbows, 12 Inches and Smaller in Diameter: Stamped, pleated, or standing seam, except fully welded where required for adjoining ductwork.

2) Round Elbows, 14 Inches and Larger in Diameter: Standing seam or welded, except fully welded where required for adjoining ductwork.

K. 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:

1) Velocity less 1000 fpm: Conical tap or 45-degree entry.

2) Velocity 1000 fpm or Higher: 45-degree entry.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity less 1000 fpm: Conical tap or 45-degree lateral.

b. Velocity 1000 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Accessories for duct systems.

1.2 ACTION SUBMITTALS

A. Provide submittals for products listed in the Product Table below in accordance with Section 230500 – General HVAC Provisions. Submittal requirements indicated by column number designation as follows:

1. Materials List
2. Catalog Data
3. Product Data
4. Performance Data
5. Wiring Diagrams
6. Shop Drawings
7. Installation Instructions
8. Special Requirement listed herein.

PRODUCT TABLE	1	2	3	4	5	6	7	8
Manual Volume Dampers		x						
Turning Vanes		x						
Flexible Ducts		x						

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

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: G60.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

C. 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 MANUAL VOLUME DAMPERS

A. Acceptable Manufacturers

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Greenheck

b. Nailor Industries Inc.

c. Pottorff.

d. Ruskin Company.

e. Trox USA Inc.

f. Young Regulator Company.

B. Round Single Blade Manual Volume Dampers:

1. Operating Conditions:

a. Maximum temperature: 180ºF

b. Maximum differential pressure: 1-inch water column.

c. Maximum air velocity: 2,000 fpm.

d. Standard leakage rating.

2. Suitable for horizontal or vertical applications.

3. Frames:

a. One piece 20-gauge construction. Material to match connected ductwork.

4. Blades:

a. Single blade.

b. 20-gauge construction. Material to match connected ductwork.

c. Stiffen damper blades for stability.

5. Blade Axles: Minimum 3/8-inch diameter plated steel or stainless steel, except stainless steel where adjacent ductwork is aluminum or stainless steel.

6. Bearings:

a. Oil-impregnated bronze, except stainless-steel sleeve where aluminum or stainless-steel frames are required.

b. Dampers shall have axles full length of damper blades and bearings at both ends of operating shaft.

7. Actuator:

a. Manual quadrant, except where remote damper operator is required.

b. Elevated platform for insulated duct mounting.

C. Single Blade Rectangular Manual Volume Dampers:

1. Operating Conditions:

a. Maximum temperature: 180ºF

b. Maximum differential pressure: 1-inch water column.

c. Maximum air velocity: 2,000 fpm.

d. Standard leakage rating.

2. Suitable for horizontal or vertical applications.

3. Frames: Hat-shaped, welded or gusset reinforced corners. 18-gauge construction. Material to match connected ductwork.

4. Blades:

a. Single blade.

b. 20-gauge construction. Material to match connected ductwork.

c. Stiffen damper blades for stability.

5. Blade Axles: Minimum ½ inch dia. plated steel or stainless steel, except stainless steel where adjacent ductwork is aluminum or stainless steel.

6. Linkages: Concealed in jamb outside or air stream.

7. Bearings:

a. Oil-impregnated bronze, except stainless-steel sleeve where aluminum or stainless-steel frames are required.

b. Dampers shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Actuator:

a. Manual quadrant, except where remote damper operator is required.

b. Elevated platform for insulated duct mounting.

2.4 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Ductmate Industries, Inc.

2. Duro Dyne Inc.

3. Elgen Manufacturing.

4. SEMCO LLC.

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. 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.

D. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

E. Vane Construction: Single wall for ducts up to 18 inches wide and double wall for larger dimensions.

2.5 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Flexmaster U.S.A., Inc.
2. JP Lamborn Co.
3. McGill AirFlow LLC.
4. Thermaflex; a Flex-Tek Group company.

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
2. Maximum Air Velocity: 4,000 fpm.
3. Temperature Range: Minus 20 to plus 175°F.
4. Insulation R-Value: R4.2.

C. Flexible Duct Elbow Support:

1. Manufacturers: Titus, Flexright, Thermaflex, FlexFlow, or equal.
2. Description: Radius forming brace to support flexible air ducts. UL 2043 listed.
3. Material" polypropylene brace, nylon cable ties to secure duct to boards.
    a. Flexright.

2.6 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.

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. Provide low leakage control dampers as close as possible to the inlet of building exhaust fans as required by Oregon Energy Efficiency Specialty Code.

D. Install products in locations that are accessible and that will permit adjustment and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

E. Manual Volume Dampers:

1. Install in ductwork where shown on drawings and as required to properly balance airflow rates to values shown on Drawings. Provide damper for each air inlet and outlet.
2. 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.

3. Dampers must be accessible to allow inspection, adjustment, and replacement of components.

4. Do not compress or stretch the damper frame into the duct or opening. Damper shall move freely throughout full range of travel.

5. Dampers shall be rigid and secure not producing any audible noise due to vibration of components.

6. Set dampers to fully open position before testing, adjusting, and balancing.

F. Turning Vanes

1. Install in mitered ductwork elbows and as shown on drawings.

2. Install with leading and trailing edges parallel to entering and leaving airflow.

G. Flexible Ductwork

1. Install in professional manner with straight sections without bends or sagging. Bends in flexible ductwork shall not exceed 20 degree unless supported by a Flexible Duct Elbow Support. Maximum length of 48-inchs or as detailed on Drawings.

2. Connect flexible duct directly to diffusers and grilles, except where otherwise shown on drawings. Provide Flexible Duct Elbow Support at 90-degree elbow to diffuser or grille.

3. Connect flexible ducts to metal ducts with tape and draw bands.

a. Tape inner duct liner to ductwork.

b. Secure inner duct liner with nylon draw strap.

c. Secure outer liner with nylon draw strap.

H. Test Holes

1. Install test holes at fan inlets and outlets, coil inlets and outlets, and elsewhere as indicated.

3.2 APPLICATION

A. Manual Volume Dampers:

1. Material: Volume damper construction frame and blade material shall match material of connected ductwork.

2. Type:

a. Round/Oval Single Blade Manual Volume Dampers: All round ductwork 20-inch diameter and below.

b. Rectangular Single Blade Manual Volume Dampers: Rectangular ductwork where largest cross-sectional dimension is 18-inches and below.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.

4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper prior to covering work or limiting access for inspection.

END OF SECTION

SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-duct air terminal units.
2. Casing liner.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of air terminal unit.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01, include the following:
   a. Instructions for resetting minimum and maximum air volumes.
   b. Instructions for adjusting software set points.

1.5 QUALITY CONTROL

A. All sound data shall be compiled in an independent laboratory and in accordance with the latest version of AHRI Standard 880 and ANSI/ASHRAE Standard 130.

B. All units shall be AHRI certified and bear the AHRI certification label.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

2.2 SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Krueger.

2. Nailor Industries Inc.
3. Price Industries.
4. Titus.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: Single wall

1. Outer Casing: 22-gauge thick galvanized steel.
2. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner. All cut edges shall be secured with steel angles or end caps to encapsulate edges and prevent erosion.
3. Air Inlet: Stub connection or S-slip and drive connections for duct attachment. Size as scheduled.
4. Air Outlet: S-slip and drive connections.
5. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Volume Damper: 18-gauge galvanized steel with peripheral gasket and self-lubricating bearings. 1/2" dia. plated steel drive shaft with indicator mark on the end of the shaft shows damper position

1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.

E. Primary Airflow Sensor: Multiple sensing point differential pressure airflow sensor for all duct diameters greater than 6 inches. Sensor shall output an amplified differential pressure signal at least 2.5 times greater than a standard velocity pressure signal. Sensor shall develop a differential pressure no less than 0.03 inches w.g. at an air velocity of 450 fpm. Brass balancing taps and airflow calibration charts provided for field airflow measurements.

F. Hydronic Heating Coils: Provided hereunder. Refer to 23 82 16 - Air Coils.

1. Fins spaced no closer than 0.1 inch
2. Include manual air vent and drain valve.

G. Performance: As scheduled on Drawings.

H. Controls: Damper actuator and damper controller furnished by the Building Automation System (BAS) manufacturer and factory installed and calibrated by the terminal unit manufacturer. See Section 230923 – Building Automation Systems for HVAC.

2.3 CASING LINER

A. Casing Liner: Fibrous-glass duct liner, complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard." Foil scrim draft facing where exposed to airstream.

1. Maximum Thermal Conductivity:
   a. Minimum Thickness: 3/4 inch.
      1) Type I, Flexible: 0.31 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

a. Adhesive shall have a VOC content of 80 g/L or less.

b. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to AHRI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and AHRI certification seal.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. 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 and for slabs more than 4 inches thick.

4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4-inch thick.

5. Do not use powder-actuated concrete fasteners for seismic restraints.

B. Hangers Exposed to View: Threaded rod and angle or channel supports.

C. 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.

3.2 TERMINAL UNIT INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.3 CONNECTIONS

A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.

B. Hot-Water Piping: Unless otherwise indicated, connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

C. Make connections to air terminal units as detailed on Drawings.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as 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.

END OF SECTION

SECTION 23 37 13 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Diffusers
2. Grilles

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling 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. Ceiling suspension assembly members.
2. Size and location of initial access modules for acoustical tile.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Duct access panels.

PART 2 - PRODUCTS

2.1 COMMON REQUIREMENTS

A. Source Quality Control

1. Verification of Performance: Rate diffusers according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following, unless specifically stated otherwise:

1. Anemostat Products; a Mestek company.
2. Krueger.
3. Nailor Industries Inc.
4. Price Industries.
5. Titus.

2.2 RECTANGULAR AND SQUARE CEILING DIFFUSERS

A. Square and Rectangular Neck Louvered Diffusers SD-1

1. Basis of Design: Titus TDC
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Duct Inlet: Square or rectangular, size as shown on Drawings.

5. Pattern: Four-way core style, or as shown on drawings.
6. Mounting:
    a. Suspended Ceiling: Flush, border type and module size compatible with ceiling system.

2.3 LINEAR SLOT DIFFUSERS

A. Slot Diffuser LSD-1

1. Basis of Design: Titus
2. Material - Shell: Steel,.
3. Material - Pattern Controller and Tees: Aluminum.
4. Finish - Face and Shell: Baked enamel, black.
5. Finish - Pattern Controller: Baked enamel, black.
6. Finish - Tees: Baked enamel, white.
7. Slot Width: 1 inch.
8. Number of Slots: Two.
9. Length: 24 inches.
10. Plenum: Contractor fabricated internally lined supply plenum with side inlet.

2.4 RETURN GRILLES

A. Fixed Blade Grille RG/EG-1

1. Basis of Design: Titus 350 RL/RS
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Blade Arrangement: 35-degree blade deflection. Spaced 3/4 inch apart. Blades parallel to long dimension if installed in ceiling or horizontal position. Blades parallel to floor if installed in wall or vertical position.
5. Frame: 1-1/4 inches wide.
6. Mounting:
    a. Suspended Ceiling: Flush, border type and module size compatible with ceiling system.
    b. Exposed: Countersunk screw.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

D. Mounted devices tight to finished surface

3.3 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 82 16 - AIR COILS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hydronic heating and cooling air coils.
2. Heat recovery water coils.
3. Steam air coils.
4. Refrigerant air coils.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil.
2. Include rated capacities and operating characteristics including:
   a. Tube water velocity for hydronic coils
   b. Pressure drops for each air coil.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which coil location and ceiling-mounted access panels are shown and coordinated with each other.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air coils to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Selection Criteria:

1. Hydronic Coil Tube Velocity: Coils shall be selected with appropriate tube water velocity to ensure acceptable performance at low load conditions. Coils tube water velocity at rated operating conditions shall be equal to or greater than the following, except where limited by minimum tube diameter or maximum coil pressure drop:
   a. Heating water coils: 2.5 feet per second.
2. Hydronic Coil Water Pressure Drop: Coils shall be selected for a maximum water pressure drop as follows, except pressure drop is scheduled on drawings:
   a. Terminal unit reheat coils: 5 feet water column.

2.2 HYDRONIC COILS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aerofin.

2. Carrier Corporation; a unit of United Technologies Corp.
3. Colmac Coil Manufacturing, Inc.
4. Daikin Industries
5. Greenheck Fan Corporation.
6. Heatcraft Worldwide Refrigeration.
7. Trane.

B. Performance Ratings: Tested and rated according to AHRI 410 and ASHRAE 33.

C. Minimum Working-Pressure/Temperature Ratings: 200 psig, 325°F.

D. Source Quality Control: Factory tested to 300 psig.

E. Tubes: ASTM B 743 copper, minimum thickness 0.025 inch for tubes 5/8” and larger, 0.020inch for 1/2-inch tubes. Minimum diameter, 0.5 inch.

F. Fins: Aluminum, minimum 0.0075 inch thick.

G. Headers:

1. Copper runout piping or for open loop systems with untreated water sources such as city potable water or well systems: Seamless copper tube with brazed joints, prime coated or cast iron with cleaning plugs and drain and air vent tappings.
2. Steel runout piping in closed loop systems: Steel with brazed joints, prime coated or cast iron with drain and air vent tappings.

H. Hot-Water Coil Capacities and Characteristics:

1. Coil Face Dimensions: As scheduled on Drawings or as required to achieve scheduled performance.
2. Minimum Fin Spacing: 0.083 inch.
3. Tube Diameter: As required to achieve scheduled performance.
4. Number of Rows: As required to achieve scheduled performance.
5. Frames: Galvanized-steel channel frame, minimum 0.064 inch thick
6. Mounting: Flanged.
7. Performance: As scheduled on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine ducts, plenums, and casings to receive air coils for compliance with requirements for installation tolerances and other conditions affecting coil performance.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before coil installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install coils level and plumb.

B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible.

C. Straighten bent fins on air coils.

D. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

E. Seal joints to eliminate air bypassing coil or leakage from ductwork at coil piping and drain connections.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to coils to allow service and maintenance.

C. Connect water piping with unions and shutoff valves to allow coils to be disconnected without draining piping.

END OF SECTION

SECTION 23 82 39 -UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes unit heaters with electric-resistance heating coils including:

1. Wall unit heaters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and 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. Indicate location and arrangement of integral controls.

4. Wiring Diagrams: Power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

PART 2 - PRODUCTS

2.1 COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 2021.

2.2 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.3 WALL UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chromalox, Inc.

2. INDEECO.

3. Markel Products; TPI Corporation.
4. Marley Engineered Products.

B. Description

1. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

C. Cabinet

1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
4. Recessed-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

D. COIL

1. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection.

E. Fan and Motor

1. Fan: Aluminum propeller directly connected to motor.
2. Motor: Permanently lubricated.

F. Controls

1. Controls: Unit-mounted thermostat.
2. Electrical Connection: Factory wire motors and controls for a single field connection.

G. Capacity and Characteristics

1. Performance: As scheduled on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install unit heaters level and plumb.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust initial temperature set points.

END OF SECTION

SECTION 26 01 55 – ELECTRICAL SYSTEMS FIRESTOPPING

PART 1 - GENERAL

1.1 SCOPE

A. Section includes requirements for through-penetration fire stopping for items including, but not limited to, conduit and cable tray provided under Divisions 26, 27, and 28.

B. Section also includes requirements for recessing fixtures, cabinets, or devices in fire rated walls, ceilings, and floors.

C. Products shall be of a single manufacturer for each type of fire stopping required, and where several types are integrated into a single assembly. Provide putty sealants, wraps, boards, and accessories as necessary and required for the work of this project.

1.2 REFERENCES

A. Underwriters Laboratories:

1. UL Fire Resistance Directory
2. UL Component Listing Test Criteria
3. Warnock Hersey

B. American Society for Testing and Materials Standards:

1. ASTM E 814 – 88: Standard Test Method for Fire Tests of Through-Penetration Firestops.

C. International Building Code, current edition, with Oregon Amendments (Oregon Structural Specialty Code, OSSC, current edition) – Chapter 7 Fire Resistance Rated Construction.

1.3 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to a given type of construction.

B. Barriers: Time rated fire walls, ceiling/floor assemblies, and structural floors.

C. Firestopping: Assembly of materials applied at penetrations to limit spread of heat, fire, gases, and smoke.

D. Penetration: Opening through or into a barrier such the full thickness of rated materials is not obtained.

E. System: Specific products and applications, classified and numbered by Underwriters Laboratories (UL), Inc. to close specific barrier penetrations.

F. F Rating: Time period that fire stop assembly can withstand fire and hose stream test as determined in UBC Standard 7-5.

G. T Rating: As required for F Rating and to limit temperature rise above initial temperature to 325°F on protected sides as determined in UBC Standard 7-5.

1.4 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Provide manufacturer’s installation drawings and instructions for each proposed assembly. Identify intended product and applicable UL System number or UL classified devices.

B. Provide manufacturer recommendations and drawings relating to non-standard applications where necessary.

1.5 QUALITY ASSURANCE

A. Installer Qualification: Acceptable to, or certified by, Firestopping system manufacturer.

B. Regulatory Requirement: Contractor shall verify acceptance from Authority Having Jurisdiction for proposed assemblies conforming to, or not conforming to, specific UL Fire Stop System Numbers, or UL classified devices.

C. Products shall comply with the requirements of Oregon Revised Statute (ORS) 453.005 (7) (e), effective January 1, 2011. The referenced statute limits the use of three types of brominated fire-retardant chemicals, which are defined as hazardous substances.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original, unopened packaging with legible manufacturer's identification. Store materials in accordance with manufacturer's instructions. Store in clean, dry, ventilated location, protected from freezing.

1.7 WARRANTY

A. Submit copies of written warranty for Firestopping assemblies. Warranty period shall be one year minimum.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fire Stop products and accessories shall be asbestos-free, intumesce when exposed to temperatures of 250°F, and maintain an effective barrier against flame, smoke and gases. Mortar systems must be Warnock Hersey approved.

B. Fire Stop Fire Rating: Not less than the rating of barrier penetrated in which firestopping will be installed.

2.2 FIRESTOPPING ASSEMBLIES

A. Assemblies of materials used to seal spaces around penetrations shall have a UL Fire Stop System Number appropriate for the construction type, penetration type, annular space requirements, and fire rating at each penetration.

B. Systems and devices must withstand the passage of cold smoke either as an inherent property of the system or by the use of a separate product included as part of the UL system or devices and designed to perform this function. Systems complying with the requirements for through-penetration firestopping in fire-rated construction are acceptable provided the system will provide a smoke seal.

C. Performance Requirements: Fire Stop assembly shall be able to withstand standard fire and hose stream test (F Rating) and limit temperature rise (T Rating) of penetrations on protected side as required by Authorities Having Jurisdiction. Conform to UBC Standard 7-5.

D. Manufacturers: 3M, Dow, Chase Technology Corp., Bio Fireshield Inc., Johns Manville, Specified Technologies Inc., Metacaulk, GS Hevi-Duti/Nelson, or approved.

2.3 ACCESSORIES

A. Fill, void, or cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.

B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide Firestopping seal at cable tray, wiring, or conduit penetration, installed under Divisions 26, 27 and 28, through fire rated construction.

B. Provide fire rated assembly around electrical devices, panelboards, outlet boxes, back boxes, cabinets, and luminaires recessed in fire rated walls and ceilings. See Architectural drawings for locations of fire rated walls and ceilings.

C. Verify barrier penetrations are properly sized and in suitable condition for application of materials.

D. Provide masking and drop cloths to prevent contamination of adjacent surfaces by Firestopping materials. Clean spills of liquid components. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

E. Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance. Cut and trim materials as required to neatly match edges of penetration.

F. Comply with manufacturer's recommendations for temperature and humidity conditions before, during, and after installation of Firestopping.

END OF SECTION

SECTION 26 05 00 – GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

A. General electrical provisions apply to all work performed in Division 26, 27 and 28.

B. The Contract Documents are complementary. What is required by anyone, as affects this Division, shall be as binding as if repeated herein.

C. Separation of this Division from other Contract Documents shall not be construed as segregation of the Work.

D. Particular attention is called to Instructions to Bidders, General Conditions, Drawings and Specifications, and modifications incorporated in the documents before execution of the Agreement.

E. Location of equipment on Drawings is approximate. Plan exact location with respect to site measurements and work of other trades prior to starting work. If measurements differ slightly, modify work. If measurements differ substantially, notify Architect/Engineer and Owner's Authorized Representative prior to fabrication.

F. Make minor changes in equipment connections and equipment locations as directed or required before rough-in without extra cost.

G. Use of the word "Provide" shall be equivalent to "Furnish and Install."

1.2 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): The governmental agency or sub-agency which regulates the construction process.

B. Owner's Authorized Representative (OAR): Owner's representative with authority to act on Owner's behalf.

1.3 COORDINATION

A. Check drawings of other trades to avert possible installation conflicts. Should major changes from original drawings be necessary to resolve such conflicts, notify Architect/Engineer and secure written approval and agreement on necessary adjustments before start of work.

B. Architectural drawings govern all other drawings. Consult in detail the door swings, counter heights and similar items affecting work before rough-in.

C. Coordinate identification systems with other trades. All electrical systems shall use identical wiring, conduit, and equipment identification and regulatory signage.

1.4 SUBMITTALS AND SHOP DRAWINGS

A. See Section.

B. Action Submittal Content

1. Action submittal information not expressly required by the specifications will not be reviewed.

2. Action submittal information shall be provided in sufficient detail to establish conformance with specified requirements. Where submitted literature includes multiple models, features, or options, the specific models, features, or options proposed shall be clearly indicated. Where a brief inspection shows that product data is not complete, the submittal will be rejected without review.

3. Action submittal data shall be clear, concise, legible, and relevant. Where data is not properly organized and contains significant information that is not relevant, the submittal will be rejected without review.

4. Action submittal requirements are listed in individual specification sections. The following definitions apply.

    a. Materials List: Provide tabular list of materials including specification reference, specification product name, manufacturer, model/part number, and size and/or quantity where appropriate. Do not include supplemental data, except where specifically requested.

    b. Catalog data: Manufacturer's standard product cut sheet.

    c. Product Data: Detailed data including dimensions, weight, materials of construction, connections, and all other information needed to confirm that the product conforms to all requirements listed in the individual specification section.

    d. Performance Data: Capacity, input, output, flow, etc. as required to confirm that the product meets the performance requirements scheduled in the Specifications or on the Drawings.

    e. Wiring Diagrams: Power and control wiring diagrams.

    f. Shop Drawings: Construction drawings of items manufactured specifically for this project including dimensions, construction details, weights, and additional information to identify the physical features of the system or piece of equipment.

    g. Installation Instructions

    h. Special Requirements Listed: Additional requirements indicated in individual specification sections.

C. Delegated Design

1. Delegated work will include but is not limited to the following:

    a. Section 260548 – Seismic Control for Electrical Systems.

    b. Section 283100 – Fire Alarm.

2. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

    a. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

3. Delegated-Design Services Certification: In addition to shop drawings, product data, and other required submittals, submit digitally signed PDF electronic file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

    a. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

4. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project as required to provide AIA Level of Design 400.

    a. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings**.**

1.5 QUALITY ASSURANCE

A. All materials and equipment provided hereunder shall be installed and started in complete conformance with the manufacturer's recommendations.

B. Asbestos products or equipment or materials containing asbestos shall not be used.

C. Certify that each welder has passed the American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.

1.6 DESIGN REQUIREMENTS

A. Equipment and systems provided hereunder shall be rated to provide performance specified and scheduled on Drawings at the elevation of the project site.

B. Materials and equipment provided hereunder shall be rated for the service conditions of the system to which they are connected including but not limited to temperature, pressure, and humidity.

1.7 CODES AND STANDARDS

A. Applicable codes and standards shall determine minimum requirements for materials, methods, and labor practices not otherwise stated herein.

B. Work shall comply with the Americans with Disabilities Act (ADA).

1.8 TEMPORARY SERVICES

A. Maintain existing systems operational. Owner will be responsible to operate and maintain existing equipment during the course of the project. However, any damage to existing equipment resulting directly from work under this Contract shall be repaired by the Contractor at no expense to Owner.

1.9 OPERATIONS AND MAINTENANCE MANUALS

A. Prepare a digital file in Portable Document Format (.PDF) ~~Bind manuals in three-ring, high quality vinyl covered binders~~, clearly indexed ~~and provided with thumb tabs~~ with bookmarks for each item or product. Include a directory of all subcontractors and maintenance contractors with names, addresses, and telephone numbers, indicating the area of responsibility for each. Index ~~tabs~~ bookmarks shall match submittal schedule and include any additional information required for operations and maintenance, whether in submitted schedule or not.

B. Maintenance instructions shall indicate routine-type work with step-by-step instructions that should be performed to ensure long life and proper operations. Recommended frequency of performance shall also be included.

C. Provide copy of approved submittal for each product included in manual

D. Provide printed copy and electronic configuration files for all packaged equipment control systems furnished with equipment.

E. Mark the model actually provided where the literature covers more than one model. Include four copies of all submittal data corrected to "as-built" conditions within the manual.

F. Provide a composite summary table indicating each item of equipment listed in the operations and maintenance manual and its required maintenance and time period. This summary table shall be the first section in the O&M manual.

G. Manual Content: Manuals shall contain complete information for each item of mechanical, electrical or other operating equipment. Include as applicable:

1. Manufacturer's instructions for installation, startup, operation, inspection, and maintenance

2. Performance capacity
3. Catalog data sheets
4. Parts list
5. Maintenance schedules

1.10 RECORD DRAWINGS

A. Provide record "as-built" drawings in accordance with Division 1 requirements. Show all deviations from contract drawings and location of all underground lines by accurate dimensions from building lines. Show depth of all stub outs and underground lines. All concealed raceways, that contain feeder cables, communication conduits that are 1.5” or greater shall be dimensioned from column grids or building lines. Alternately, provide electronically using .pdf markup of contract drawings.

1.11 DEMONSTRATION

A. General: After installation is complete, demonstrate to Engineer and Owner’s Authorized Representative satisfaction as being complete and operational and entirely in conformance with Contract Documents.

B. Preparation: Prior to demonstration, submit check-off list indicating completeness of submittals and certificates of compliance for review to Owner’s Authorized Representative. Operate completed system for one week. Verify that control verification is complete and verification report has been approved by Architect/Engineer.

C. Arrange for demonstration with Owner, Engineer, required factory technicians, and installer at least one week in advance of demonstration.

1.12 TRAINING

A. Instruct Owner in proper operation and maintenance of equipment and systems. Instruction shall generally include topics listed in manufacturer’s operations and maintenance manual. Operator instructions shall cover all aspects of manual, automatic, and safety controls. Contractor shall also instruct the Owner in the general configuration of systems and location of equipment and components.

B. Furnish competent qualified technicians knowledgeable in the building electrical and lighting systems and equipment provided for this project for a minimum of 8 hours on-site to instruct Owner in operation and maintenance of systems and equipment. This figure does not include additional training noted under individual specification sections. Contractor shall keep a log of this instruction including date, times, subjects, and those present and shall present such log when requested by Engineer. Contractor shall coordinate training with Owner’s Project Manager and provide a schedule for training minimum two-weeks prior to Substantial Completion. All training shall be complete 30-days after Substantial Completion.

C. Contractor shall furnish training by equipment manufacturers in addition to training described in this section where specifically listed in other sections. Contractor shall schedule training with Owner’s Project Manager minimum 48-hours prior to training session. Equipment shall be fully operational prior to scheduling training session. Manufacturer’s field start-up, adjustment, and service will not fulfill manufacturer’s training requirement.

1.13 COORDINATION DOCUMENTS

A. General Contractor to lead trade coordination. HVAC to be responsible for Building Information Management (BIM) modeling and coordination of equipment, piping and duct systems specified in Division 23. Coordinate with fire protection trade incorporation of Division 21, plumbing trade incorporation of Division 22, and electrical trades incorporation of Divisions 26 through 28.

B. Prior to commence of construction provide detailed BIM model and layout drawings of equipment, lighting, conduit, and cable tray systems. Coordinate services installation with building architectural components including finishes, structural systems, and ceiling systems.

C. Preparation of documents:

1. Perform modeling in Revit, Navisworks, or Autodesk BIM 360 Glue.

2. Incorporate information and data required to provide AIA Level of Design 400.

3. Incorporate addenda, changes, field adjustments and RFIs into model.

4. Submit model with Record documents at project closeout.

D. Notify architect of Construction Document discrepancies and conflicts where installation requirements require greater space than is available and cannot be resolved through trade coordination efforts alone.

1. Model/drawings level of detail to include the following components:

a. Lighting, transformer, switchgear, panelboards, generators, conduits 2” and larger.

b. All conduit sizes of panelboard feeders and branch circuit conduits 2” and larger.

c. Cable trays, IT equipment and UPS

d. Equipment disconnects.

e. Networked lighting control equipment.

f. Audio/visual equipment.

1.14 WARRANTY

A. Warrant all Work included in this Specification for a period of one year form the date of substantial completion, under provisions of Division 1.

B. During warranty period, remedy without delay or expense to Owner any defects providing, in judgement of Engineer, that such defects are not result of misuse or abuse on part of Owner.

C. Warrant that all equipment and installations are in compliance with OSHA regulations.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MATERIALS

A. All materials employed in permanent construction shall be new, full weight, in first class condition, and suitable for space provided. All similar equipment and materials shall be of one manufacturer.

B. Equipment used as the basis of design is scheduled on Drawings or designated in product specifications. If Contractor chooses to use equipment that is not the basis of design, Contractor is responsible for all re-design and construction costs associated with variations in arrangement, dimension, or capacity. Such work may include, but is not limited to, changes to facility structure or dimensions and revisions to associated mechanical and electrical systems needed to provide equal system performance and maintainability.

2.2 ELECTRICAL EQUIPMENT

A. Electrical Disconnect Switch: Electrical disconnect switches specified for mechanical equipment shall conform to OSHA Lock-out/Tag-out requirements.

B. All electrical equipment shall be listed as approved for its application by the Underwriters Laboratory or other testing agency approved by the State of Oregon Electrical and Elevator Board. Approval indicates agency meets testing standard requirements for electrical safety

required by Oregon Revised Statutes 479.510 through 479.855 and Oregon Administrative Rules.

C. Enclosure: Provide the following electrical equipment enclosure types.

1. NEMA 1: Dry, enclosed locations where the ambient temperature will not be outside of the equipment temperature ratings.

2. NEMA 12: Enclosed mechanical spaces equipped with floor drains where dripping or splashing may occur and where the ambient temperature will not be outside of the equipment temperature ratings.

3. NEMA 3R: Outdoors or in spaces where sustained water spray is possible.

4. NEMA 3R: with Temperature Control: Outdoors or in unconditioned spaces where ambient temperatures will be outside of the equipment temperature ratings.

5. NEMA 4X: Outdoors or in spaces that are corrosive environments.

2.3 EQUIPMENT CONNECTIONS

A. Provide a complete electrical connection for all items of equipment including incidental wiring, materials, devices and labor necessary for a complete operating system. The location and method for connection to each item of equipment shall be verified prior to rough-in. The voltage and phase of each item of equipment shall be checked prior to connecting. Motor rotations shall be made in the proper direction. Pump motors are not to be test run until liquid is in the system and proper lubrication to all bearings in unit is checked.

B. Conduit, wire and circuit breaker sizes for mechanical and similar equipment are based on the equipment ratings of one manufacturer. The equipment actually furnished may have different electrical characteristics. Conduit, wire, and circuit breakers shall not be ordered or installed until exact electrical requirements are obtained. The Contractor is responsible for this coordination.

PART 3 - EXECUTION

3.1 ACCESS TO EQUIPMENT AND ACCESSORIES

A. Install equipment with sufficient access for service. Where not conveniently accessible by other means, provide adequately sized access doors for junction & pull boxes, relays & power packs, and all other electrical equipment requiring access for removal or maintenance. Type, size and exact location of access doors shall be coordinated with Architect prior to work.

B. Provide clearances for maintenance access as indicated on Drawings or as recommended by manufacturer. If access requirements shown on Drawings conflict with manufacturer’s recommendations, provide larger clearance of the two.

C. If equipment location shown on Drawings does not allow required access, notify Architect/ Engineer prior to start of work.

D. Apply and install all items in accordance with manufacturer’s written instructions. Refer conflicts between the manufacturer’s instructions and the contract drawings and specifications to Architect/Engineer for resolution prior to starting work.

E. Provide access doors as required for access to electrical equipment. Doors required for access are not necessarily shown on Drawings. Consult with Architect for direction on placement of required doors not shown on Drawings.

1. Comply with manufacturer's instructions for installation of access doors. Provide all necessary support and supplemental framing for assembly where the access doors are required. Set accurately in position, plumb, level, and flush to adjacent finish surfaces; and secure to support.

3.2 ARRANGEMENT AND INSTALLATION OF ELECTRICAL EQUIPMENT AND CONDUIT

A. Coordinate location of conduit, sleeves, inserts, hangers, cable trays and equipment. Locate conduit, sleeves, inserts, hangers, cable tray and equipment clear of windows, doors, openings, lights, ducts, piping, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

B. Equipment and Conduit Support: Coordinate structural systems necessary for conduit and equipment support with pipe and equipment locations to permit proper installation.

C. Location of conduit sleeves, trenches and chases shall be accurately coordinated with equipment and conduit locations.

D. Minor Conduit: Small diameter conduit runs from receptacles, lighting, equipment, and similar minor services are generally not shown but must be provided. Contractor is responsible to provide all such minor conduit where needed to maintain electrical spaces clean and neat and to allow full equipment function and maintenance.

E. Work in Existing Building: Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner’s Authorized Representative. Locate openings that will least affect structural slabs, columns, ribs or beams. Refer to the Architect/Engineer for determination of proper design for openings through structural sections and obtain layout approval prior to cutting or drilling into structure. After Architect/Engineer's approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.

F. Inaccessible Equipment

1. Where the Owner’s Authorized Representative determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.

2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.3 EXISTING EQUIPMENT REUSED OR RELOCATED

A. All equipment designated as existing or furnished by Owner shall be cleaned and repaired before reinstallation. Any items requiring repair shall be brought to the attention of the construction manager before the item is reinstalled. Damage not brought to the attention of the construction manager shall be deemed the result of reinstallation of the item and shall be repaired without expense to the Owner.

3.4 ELECTRICAL SYSTEMS FIRESTOPPING

A. Do not cover firestop installations until they are examined by the Authority Having Jurisdiction, if required.

B. Install firestopping in accordance with manufacturer’s recommendations and conditions of product UL listing.

3.5 CLEANING SYSTEMS

A. General: After all equipment, conduits and cable tray are installed, system shall be thoroughly cleaned. Remove all nonessential stickers and labels from equipment or fixtures. Clean all light fixture lenses. Clean interior of conduit systems prior to installation of wiring.

B. Repair or replace any discolorations or damage to systems, building finish, or furnishings resulting from Contractor’s failure to properly clean system.

3.6 START UP

A. The Electrical Contractor shall be responsible for proper operation of all systems and shall coordinate startup procedures, calibration and system checkout. System operational problems shall be diagnosed and corrected as required for system operation prior to Substantial Completion inspection.

B. Start equipment in accordance with manufacturer's recommendations and under manufacturer's supervision where required. Ensure that associated breakers, relays, electrical overloads, and other devices intended to protect the equipment are installed and functional prior to startup.

3.7 EXTRA STOCK

A. Provide extra stock, as described in individual sections, to Owner in accordance with Division 1.

END OF SECTION

SECTION 26 05 01 – ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SCOPE

A. It is the intent of these documents to provide the necessary information and adjustments to the electrical system required to meet Code and accommodate installation of the new work.

B. Contractor shall coordinate with the Owner so that work can be scheduled not to interrupt operations, normal activities, building access, access to different areas. The Owner will cooperate to the best of their ability to assist in a coordinated schedule but will remain the final authority as to time of work permitted.

1.2 EXISTING CONDITIONS

A. The locations of existing utilities and equipment are shown in an approximate way only and have not been independently verified by the Owner or its representative. The Contractor shall determine the exact location of all existing utilities before commencing work and agrees to be fully responsible for any and all damages which might be occasioned by the Contractor's failure to exactly locate and preserve any and all utilities and equipment. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on the Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials accumulated during the demolition process are the Owner's property and shall be removed from the job site as directed by the Owner.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Remove all existing fixtures, clocks, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled for remodeling, relocation, or demolition unless specifically shown as retained or relocated on the Drawings.

B. Disconnect all existing mechanical equipment scheduled for removal, relocation or abandonment. See mechanical drawings for scope of work. Remove abandoned cables and unusable raceways. Relabel panels and motor control centers to reflect changes.

C. Maintain electrical continuity of all existing systems. Remove or relocate electrical boxes, conduit, wiring, equipment, fixtures, etc. as may be encountered in removed or remodeled areas in the existing construction affected by this work. Wiring which serves usable existing outlets shall be removed and restored clear of the construction or demolition. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, new conduit and wire shall be provided to bypass the abandoned outlets. If existing conduits pass through partitions or ceiling which are being removed or remodeled, new conduit and wire shall be provided to reroute clear of the construction or demolition and maintain service to the existing load.

D. Extend circuiting and devices in all existing walls to be furred out.

E. Existing electrical outlets and light fixtures are denoted by dotted or dashed lines. Verify exact location of existing electrical outlets and light fixtures in the field. Only partial existing electrical shown. Locations of items shown on the Drawings as existing are partially based on as built

and other drawings which may contain errors. The contractor shall verify the accuracy of the information shown prior to bidding and provide such labor and material as is necessary to accomplish the intent of the contract documents.

F. Remove all abandoned wiring to leave site clean.

G. Keep outages to occupied areas to a minimum and prearrange all outages with the Owner's representative. Requests for outages shall state the specific dates and hours and the maximum durations, with the outages kept to these specific dates and hours and the maximum durations. This Contractor will be liable for any damages resulting from unscheduled outages or for those not confined to the preapproved times. Outages shall take place at times when the facility is not in operation or occupied by non-essential personnel. Include all costs for overtime labor as necessary to maintain electrical services in the initial bid proposal. Temporary wiring and facilities, if used, shall be removed and the site left clean before final acceptance. Requests for outages must be submitted at least (5) days prior to intended shutdown time.

H. No circuit breaker or disconnects shall be turned off without prior approval from Owner. Coordinate with the Owner's representative responsible for the area or equipment affected for any electrical interruptions which affect the operation of the remaining portions of the facility.

I. Verify with the General Contractor a location for storage of materials, supplies, tools, rubbish, etc. prior to start of work.

END OF SECTION

SECTION 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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. Metal conduits and fittings.
2. Metal wireways and auxiliary gutters.
3. Nonmetal wireways and auxiliary gutters.
4. Surface raceways.
5. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal 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. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Allied Tube & Conduit; a part of Atkore International.
    b. Calconduit.
    c. Thomas & Betts Corporation; A Member of the ABB Group.
    d. Western Tube and Conduit Corporation.
    e. Wheatland Tube Company.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.

B. Metal Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Allied Tube & Conduit; a part of Atkore International.
    b. O-Z/Gedney; a brand of Emerson Industrial Automation.
    c. Thomas & Betts Corporation; A Member of the ABB Group.
    d. Western Tube and Conduit Corporation.
    e. Wheatland Tube Company.
2. Comply with NEMA FB 1 and UL 514B.
3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Fittings, General: Listed and labeled for type of conduit, location, and use.
5. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
6. Fittings for EMT:
    a. Material: Steel.
    b. Type: Setscrew.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.

2. Hoffman; a brand of nVent.
3. MonoSystems, Inc.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 3R unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.3 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Basis of Design: Wiremold / Legrand.
b. Panduit Corp.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Crouse-Hinds, an Eaton business.
2. FSR Inc.
3. Hoffman; a brand of nVent.
4. Hubbell Incorporated.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.
6. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.

3. Shape: Rectangular.

4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep minimum.

L. Gangable boxes are allowed.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Nonmetallic Enclosures: Plastic.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Cabinets:

1. NEMA 250, Type 1 or Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.

4. Metal barriers to separate wiring of different systems and voltage.

5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armorcast Products Company.

b. Oldcastle Precast, Inc.

c. Quazite; Hubbell Incorporated, Power Systems.

2. Standard: Comply with SCTE 77.

3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

6. Cover Legend: Molded lettering, "ELECTRIC.".

7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armorcast Products Company.

b. Nordic Fiberglass, Inc.

c. Oldcastle Precast, Inc.

d. Quazite; Hubbell Incorporated, Power Systems.

2. Standard: Comply with SCTE 77.

3. Color of Frame and Cover: Gray.

4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

7. Cover Legend: Molded lettering, "ELECTRIC.".

8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations. Use LFMC only for motor connections.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic in institutional and commercial kitchens and damp or wet locations.

B. Minimum Raceway Size: 3/4-inch trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with requirements in Section 260529 – Hangers and Supports for Electrical Systems for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches of enclosures to which attached.

L. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.

2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.

4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

5. Change from ENT to GRC before rising above floor.

M. Stub-Ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

O. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

T. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

U. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

V. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Conduit extending from interior to exterior of building.
2. Conduit extending into pressurized duct and equipment.
3. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
4. Where otherwise required by NFPA 70.

W. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

X. Expansion-Joint Fittings:

1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Z. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in DIV 7.

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 52 – IDENTIFICATION FOR ELECTRICAL SYSYTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates

B. Wire and cable markers

C. Pull box and junction box identification

D. Device plate identification

1.2 REQUIREMENTS OF REGULATORY AGENCIES

A. Identification shall conform to the latest edition of the National Electrical Code (NEC), Articles 110-21 and as a minimum requirement.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nameplates:

1. Three-layer, white front and back with black core laminated plastic.

2. Engraved through outer layer to show white characters on black background.

3. Beveled edges.

4. NEC Article 700 Systems (Lighting Inverter)

a. Same nameplate requirements listed above, but with orange nameplate white characters for emergency systems distribution equipment.

B. Wire and Cable Markers:

1. Heat shrink thermo-labels.

2. Brady or Panduit.

C. Labels:

1. Adhesive Film Labels: Machine printed, in black on clear background, by thermal transfer or equivalent process.

2. Emergency receptacles/wall switches: Black on red background.

D. Panelboard Directory Card: Fiberboard neatly typed for newly installed panels. Circuit changes to existing panels shall be noted on the directory card by hand printing in ink. When more than five changes have been made on the directory card, a new card shall be typed.

PART 3 – EXECUTION

3.1 GENERAL

A. During finish construction, labeling is to be reviewed and approved by the Owner.

B. Zoned systems must be clearly defined and labeled.

C. Label at all entries into new spaces and/or through walls.

D. Covering or painting of any sign/label requires replacement.

E. Mark and label new wiring and place in tray. Include installation date.

3.2 NAMEPLATE INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or drive rivets.

1. Secure nameplate to inside face of recessed panelboard doors in finished locations.

2. Secure nameplate to outside face of panelboards in unfinished locations.

D. Where switches control remote lighting or power outlets, or where switches in the same outlet (two or more) serve different purposes such as lights, power, intercom, etc., or different areas such as corridor and outside, furnish either engraved nameplates or adhesive film labels with 1/4-inch black letters indicating function of each switch or outlet.

E. Use adhesive film labels for identification of individual wall switch and receptacle cover plates.

3.3 WIRE IDENTIFICATION

A. Labeling shall be non-destructible type which may not be removed during installation.

B. Provide wire markers on each conductor in panelboards, gutters, pull boxes, and at load connection.

C. Identify with branch circuit or feeder number for power and lighting circuits.

D. Tag lighting feeds with circuit number and panel ID.

E. Identify control wire number as indicated on equipment manufacturer’s shop drawings.

3.4 NAMEPLATE ENGRAVING SCHEDULE

A. Identify all electrical distribution, control equipment and disconnect switches at loads served.

B. 3/4-inch nameplates are to be fastened with sheet metal screws.

C. Disconnect switches and control units shall include circuit number and panel ID.

D. Letter Height:

1. 1/2-inch for individual switches and loads served.

2. 1/2-inch for distribution and control equipment identification.

3. 1/2-inch identifying voltage rating and source.

E. Transformers:

1. 1/2-inch; identifying equipment designation.

2. 1/2-inch; identifying primary source, and secondary load and location.

F. Automatic Transfer Switches shall have a red background with 1/2-inch white lettering.

3.5 PULL BOX AND JUNCTION BOX IDENTIFICATION

A. Provide permanent signage, interior and exterior at all utility boxes, vaults, manholes, etc.

B. Install labels on inside of junction boxes and adhesive film label on the box cover.

C. Identify each junction box with complete system description. Examples:

1. Fire alarm.

2. Telephone.

3. 480V system.

4. 208V system.

D. Methods:

1. Neat hand lettering with permanent black marker.
2. Engraved nameplates.
3. Adhesive film labels.

E. Emergency power junction boxes and conduit (NEC Article 700 Systems):

1. Paint emergency power junction boxes and conduits orange and label junction boxes “EMERGENCY” and identify circuits prior to installation.

F. Fire alarm junction boxes:

1. Paint fire alarm junction boxes and covers red and label “FIRE ALARM” prior to installation.

G. Locations:

1. On outside of box cover where concealed.
2. In exposed box locations, locate on inside of box cover.
3. Identify main pull boxes by number and indicate numbers on record drawings.

3.6 DEVICE PLATE IDENTIFICATION

A. 1/4-inch letter height.

B. Black letter color.

C. Location:

1. Bottom center of device plate for single gang and multiple gang outlets.
    a. Provide branch circuit identification (example: “B-16” indicating panel “B” circuit #16).

END OF SECTION

SECTION 26 27 26 – WIRING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Toggle switches, 120/277 V, 20A.
4. Wall plates.
5. Floor box assemblies.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. EMI: Electromagnetic interference.

C. GFCI: Ground-fault circuit interrupter.

D. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

E. RFI: Radio-frequency interference.

F. SPD: Surge protective device.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Box Assemblies: One for every 10, but no fewer than one.
2. Poke-Through Assemblies: One for every eight, but no fewer than one.
3. SPD Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Comply with NFPA 70.

C. RoHS compliant.

D. Comply with NEMA WD 1.

E. Devices that are manufactured for use with modular plug-in connectors are not permitted.

F. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations.

2. Cord and Plug Sets: Match equipment requirements.

G. Device Color:

1. Wiring Devices Connected to Normal Power System: White.

2. Wiring Devices Connected to Emergency (NEC 700) or Standby Power (NEC 701) Systems: Red.

3. SPD Devices: Blue

H. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

I. Quick connect, plug in or push in, modular receptacles are not allowed.

2.2 SPECIFICATION-GRADE RECEPTACLES, 125 V, 20 A

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Incorporated (Commercial and Industrial Group - Wiring Devices-Kellems).

2. Leviton Manufacturing Co., Inc.

3. Pass & Seymour/Legrand (Pass & Seymour).

B. Duplex Receptacles, 125 V, 20 A:

1. Description: Two pole, three wire, and self-grounding.

2. Configuration: NEMA WD 6, Configuration 5-20R.

3. Standards: Comply with UL 498 and FS W-C-596.

2.3 GFCI RECEPTACLES, 125 V, 20 A:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Incorporated (Commercial and Industrial Group - Wiring Devices-Kellems).

2. Leviton Manufacturing Co., Inc.

3. Pass & Seymour/Legrand (Pass & Seymour).

B. Duplex Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with “Test” and “Reset” buttons and LED indicator light. Two pole, three wire, and self-grounding.

2. Configuration: NEMA WD 6, Configuration 5-20R.

3. Type Non-feed.

4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

C. Weather-Resistant, GFCI Duplex Receptacle, 125 V, 20 A:

1. Description: Integral GFCI with “Test” and “Reset” buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type Non-feed.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, “Receptacles in Damp or Wet Locations” Article.

2.4 SPD RECEPTACLES, 125 V, 20 A:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Hubbell Incorporated (Commercial and Industrial Group - Wiring Devices-Kellems).
2. Leviton Manufacturing Co., Inc.
3. Pass & Seymour/Legrand (Pass & Seymour).

B. Duplex SPD Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral SPD in line-to-ground, line-to-neutral, and neutral-to-ground. LED indicator light.
2. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
3. Active SPD Indication: Visual and audible, with light visible in the face of device to indicate device is “active” or “no longer in service.”
4. Configuration: NEMA WD 6, Configuration 5-20R.
5. Standards: Comply with NEMA WD 1, UL 498, UL 1449, and FS W-C-596.

2.5 TWIST-LOCKING RECEPTACLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Hubbell Incorporated (Commercial and Industrial Group - Wiring Devices-Kellems).
2. Leviton Manufacturing Co., Inc.
3. Pass & Seymour/Legrand (Pass & Seymour).

B. Twist-Lock, Single Receptacles, 120 V, 20 A:
1. Configuration: NEMA WD 6, Configuration L5-20R.
2. Standards: Comply with UL 498.

C. Twist-Lock, Single Receptacles, 250 V, 20 A:
1. Configuration: NEMA WD 6, Configuration L6-20R.
2. Standards: Comply with UL 498.

D. Twist-Lock, Single Receptacles, 250 V, 30 A:
1. Configuration: NEMA WD 6, Configuration L6-30R.
2. Standards: Comply with UL 498.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Premise Wiring.
2. Leviton Manufacturing Co., Inc.
3. Pass & Seymour/Legrand (Pass & Seymour).

B. Description: Matching, locking type plug and receptacle body connector, heavy-duty grade.

C. Configuration: NEMA WD 6, Configurations L5-20P and L5-20R.

D. Body: Nylon, with screw-open, cable-gripping jaws and provisions for attaching external cable grip.

E. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

F. Standards: Comply with FS W-C-596.

2.7 TOGGLE SWITCHES, 120/277 V, 20 A

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hubbell Incorporated (Commercial and Industrial Group - Wiring Devices-Kellems).
2. Leviton Manufacturing Co., Inc.
3. Pass & Seymour/Legrand (Pass & Seymour).

B. Single-, Two-Pole, Three- and Four-Way Switches, 120/277 V, 20 A:

1. Standards: Comply with UL 20 and FS W-S-896.

C. Pilot-Light, Single-Pole Switches, 120/277 V, 20 A:

1. Description: Illuminated when switch is on.
2. Standards: Comply with UL 20 and FS W-S-896.

2.8 WALL PLATES

A. Single Source: Obtain wall plates from the same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for devices connected to normal source: Finished Spaces: 0.035-inch-thick, satin finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for devices connected to Emergency (NEC 700) or Standby Power (NEC 701): smooth, rigid impact resistant, nylon/thermo-plastic
    a. Wall plate color: Red.
5. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.9 FLOOR BOX ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Basis of Design: FSR, Inc.
2. Hubbell Premise Wiring.
3. Wiremold / Legrand.

B. Description: Type: Modular, flush-type, dual service units suitable for wiring method, used, with cover flush with finished floor.

C. Suitable for installation in Slab-on-Grade or Cast-in-Place concrete:

1. Fully adjustable, rectangular, 8-gang box.
2. Minimum pour depth:
3. Slab-on-Grade: Provide floor box enclosure listed for installation on-grade.
4. Cast-in-place/Wood floor: Formed code-gauge steel box.

D. Compartments: Barrier Separates power from low voltage cabling.

E. Service Plate and Cover: Rectangular, die-cast aluminum, finish color shall be verified with Architect.

F. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

G. Data Communication Outlet: Four modular, keyed, color-coded, RJ-45 jacks for twisted pair cable, complying with requirements in Section 271513 – Communications Copper Horizontal Cabling."

H. Line and low voltage wiring shall be separated within floor box assembly. Line voltage wiring shall utilize a single side of floor box compartment and low voltage wiring shall utilize the remaining side.

I. Provide any additional accessories or appurtenances necessary for a fully functional floor box assembly.

2.10 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. FSR, Inc.
2. Hubbell Incorporated (Commercial and Industrial Group - Wiring Device-Kellems).
3. Wiremold / Legrand.

B. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.

C. Standards: Comply with scrub water exclusion requirements in UL 514.

D. Service-Outlet Assembly: Flush type with two, dual 20A pre-wired receptacles and space for up to six RJ-45 jacks, complying with requirements in Section 27 15 13 "Communications Copper Horizontal Cabling."

E. Size: Selected to fit nominal 8-inch cored holes in floor and matched to floor thickness.

F. Fire Rating: Unit is listed and labeled for the fire rating of floor-ceiling assembly.

G. Closure Plug: Arranged to close unused 8-inch cored openings and reestablish fire rating of floor.

H. Wiring Raceways and Compartments: For a minimum of five No. 12 AWG conductors and a minimum of eight, four-pair cables that comply with requirements in Section 27 15 13 “Communications Copper Horizontal Cabling.”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking the solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. Where there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by manufacturer.

7. When conductors larger than No. 12 AWG are installed on 20-A circuits, splice No. 12 AWG pigtails for devices connections.

8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

10. Install toggle switches at 48 inches (to center line of faceplate) above finished floor with OFF position down, unless otherwise noted.
11. Install receptacles at 18 inches (to center line of faceplate) above finished floor, unless otherwise noted.
12. Verify mounting height and orientation of wiring devices above counter tops and benches with Architectural Details prior to rough-in.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates:

1. Do not use oversized or extra-deep plates.
2. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush, level or do not cover rough wall opening.
3. Where outlets are adjacent to each other at same mounting heights, install under common device plate, except where outlets are of different voltages, such as data and duplex receptacle, unless otherwise noted.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. Furnish and install wiring devices of number, rating and type shown.

I. Devices to include appropriate outlet box, cover, wall plate and other necessary installation materials for a complete operating outlet.

J. Back wiring wells may be used for receptacles.

K. Grounding: Install a separate green or bare wire between the receptacle strap grounding (green) screw and a screw into the outlet box. Self-grounding strap not approved as grounding means.

3.2 GFCI RECEPTALCES

A. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required.

3.3 FLOOR BOX AND POKE THROUGH ASSEMBLIES

A. Coordinate all locations indicated with Architectural prior to rough-in and adjust as required.

B. Set assemblies level and flush with finish flooring material.

C. Follow manufacturer’s installation instructions.

3.4 FLOOR BOX AND POKE-THROUGH ASSEMBLIES SCHEDULE

Type	Floor Style	Nominal Size	Floor Box Style	Gangs	Model/ Series No.	Accessories	Cover Assemblies
PT-1	Concrete	7 1/4. Dia. x 16-1/8 in.	Poke-Through	3	Evolution 6 Series	(2) 68REC (1) 6ACT8A	SF8-CVR-XXX

3.5 IDENTIFICATION

A. Comply with Section 26 05 53 “Identification for Electrical Systems.”

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.6 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 150A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the devices and its outlet box are securely mounted.
6. Test shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units, and replace with new ones and retest as specified above.

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 26 51 00 – LIGHTING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes supply and installation of luminaires, supports and accessories; and supply of plaster frames, trim rings and backboxes for plaster, tile, drywall or concrete ceilings.

1.2 REFERENCE STANDARDS

A. National Electrical Manufacturer's Association (NEMA)

1. NEMA SSL 1: Electronic Drivers for LED Devices, Arrays, or Systems.

1.3 COORDINATION

A. Confirm compatibility and interface of other materials with luminaire and ceiling system. Report discrepancies to the Engineer/Architect and defer ordering until clarified.

B. Supply plaster frames, trim rings and backboxes to other trades.

C. Coordinate with Division 22 and 23 to avoid conflicts between luminaires, supports, fittings, piping, and mechanical equipment.

1.4 JOB CONDITIONS

A. Existing Conditions:

1. Prior to ordering lighting fixtures, verify finish material in locations where lighting fixtures are mounted.

2. Prior to ordering lighting fixtures, verify conditions for mounting lighting fixtures and select proper mounting hardware.

3. Verify fire rating of new ceilings.

1.5 SUBMITTALS

A. Submit the following in accordance with Section 26 05 00, General Electrical Provisions:

1. Shop Drawings, include the following:

a. Product Data.

1) Manufacturer’s published product data.

2) Limit submittal to no more than four pages for each type specified.

3) ETO Incentive Assessment Criteria:

a) Qualified Product List Certification (Design Lights Consortium, Energy Star)

b) Incremental fixture cost

c) Measure Description

b. Fully dimensioned line drawing.

c. LED lamp information, including proof of conformance with the following:

1) ANSI C78.377-2017

2) IES LM 79-19

3) IES LM 80-15

4) IES TM 21-11

a. Mounting details including clips, canopies, supports, and methods for attachment to structure. Provide equipment for row configurations.

b. UL/ETL labeling information

c. Manufacturer's Warranty

d. Luminaire photometric reports

2. Energy incentive program product documentation

a. Include all product data and installation documentation required for procurement of Energy Trust of Oregon (ETO) incentives.

3. Operation and Maintenance Data:

a. Prepare a digital file in Portable Document Format (.PDF) of a lighting systems maintenance manual consisting of the following for review.

1) A complete set of final submittals of actual products installed, including product data and shop drawings. Include product data for actual power supplies and transformers installed where applicable.

2) Re-lamping instructions for lamps that require special precautions (LED, metal halide, etc.).

3) Luminaire cleaning instructions, including chemicals to be used or avoided.

4) Parts list of major luminaire components and ordering information for replacement.

5) Copies of manufacturer warranties.

4. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires installed and comply with designated structural design criteria.

5. Manufacturer's Installation Instructions:

a. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

6. Closeout Submittals:

a. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

b. Maintenance Materials: Furnish for Owner's use in maintenance of project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Refer to LUMINAIRE SCHEDULE.

2.2 RECESSED LUMINAIRES

A. Recessed Incandescent Luminaires: Prewired type with junction box forming an integral part of the assembly.

B. Supply recessed luminaire complete with trim type required for ceiling system installed. Before ordering, confirm ceiling construction details and architectural finish for each area.

2.3 PENDANTS/CABLE HANGERS

A. Swivel sockets permitting normal fixture motion and self-adjustment. Adjustable to provide fixture height alignment.

B. One-piece, white finish, with matching canopies.

C. Fixtures shall be factory counter-weighted and balanced to provide level hanging. Weights shall not be visible.

D. Cable hangers shall be adjustable for a minimum of 18".

2.4 LED LUMINAIRES

A. General:

1. LED light fixtures shall be in accordance with IES, NFPA, UL as shown on the Drawings and as specified.

2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS) compliant.

3. LED drivers shall include the following features unless otherwise indicated:

a. Minimum Efficiency: 85% at full load.

b. Minimum Operating Ambient Temperature: -20°C (-4°F).

c. Input Voltage: 120-277V (±10%) at 60 Hz.

d. Integral short circuit, open circuit, and overload protection.

e. Power Factor: ≥ 0.95.

f. Total Harmonic Distortion: ≤ 20%.

g. 4-wire (0-10VDC voltage controlled) dimming driver.

1) Capable of dimming to black from 100% to 1% light output and step to 0%. Driver shall respond similarly when raising from 0% to 100%.

h. Driver shall be free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10).

4. LED modules shall include the following features unless otherwise indicated:

a. Comply with IES LM-79 and LM-80 requirements.

b. Minimum CRI 80 and color temperature 4000˚ K unless otherwise specified in LUMINAIRE SCHEDULE.

c. Minimum Rated Life: 50,000 hours per IES L70.

d. Light output lumens as indicated in the LUMINAIRE SCHEDULE.

B. LED Downlights:

1. Housing, LED driver, and LED module shall be products of the same manufacturer.

C. LED Troffers:

1. LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.

2. Housing, LED driver, and LED module shall be products of the same manufacturer.

2.5 CORRELATED COLOR TEMPERATURE (CCT) AND COLOR RENDERING INDEX (CRI)

A. Refer to LUMINAIRE SCHEDULE.

PART 3 EXECUTION

3.1 COORDINATION

A. Refer to Reflected Ceiling Plans for exact locations with respect to ceiling construction.

B. Consult Finish Schedule for ceiling and wall construction and finish.

C. Prior to ordering lighting fixtures, coordinate style of mounting with ceiling construction and trim details for ceiling system finally selected.

3.2 SURFACE MOUNTING

A. Attach with means that will draw fixtures snugly to finished surface without bending or tipping. Twist-on clips with studs not allowed on exposed "T" grid ceilings, except where specified. Support from channel above ceiling framing members with bolt at each corner of fixture.

3.3 PENDANTS

A. Support from structure per paragraph titled “SUPPORT”.

B. Provide steel, stranded safety cable between fixture and structure to support fixture in the event of a pendant breakage.

3.4 SUPPORT

A. Suspended ceiling:

1. Positively attach all light fixtures to the suspended ceiling system. The attachment device shall have a capacity of 150% of the lighting fixture weight acting in any direction.

2. Support grid with No. 12 minimum gage hangers attached to the grid members within 3 inches of the corner of each fixture, attached to structure above.

3. Attach two No. 12 minimum hangers from the fixture housing to the structure above. These wires may be slack.

4. Where suspended fixtures do not align with grid, provide “bridging” above grid and support from structure.

5. Support pendent-hung lighting fixtures directly from the structure above with No. 9 minimum wire or approved alternate support.

B. Support all other fixtures from structure by method rated at least five times support weight.

3.5 ACCESS

A. Recessed fixtures shall have code accessible supply. Use reach-through type fixtures in non-accessible ceilings or other suitable means. Coordinate with ceiling installer.

3.6 FIRE RATED CEILINGS

A. Where a ceiling carries a fire rating, recessed fixtures shall carry UL rating for use in protective enclosures. Coordinate installation of protective enclosures to provide sufficient air space for heat dissipation. 3 inch minimum all around.

3.7 PREPARATION

A. Field Measurements:

1. See architectural reflected ceiling plans for exact location of ceiling mounted lighting fixtures.

2. See architectural elevations for exact location of wall mounted lighting fixtures.

3. Coordinate lighting fixture location in mechanical spaces with mechanical equipment. Report adverse conditions to Architect.

4. Lighting fixtures are generally located for symmetrical pattern and to suit structural conditions. Location changes shall be approved by Architect.

5. Provide reinforced concrete pole bases elevated minimum of 24 inches above finished grade when exterior lighting fixtures are located within 3’-0” of curb of vehicular traffic areas, unless otherwise noted. See detail on Drawings.

6. Do not install any work until any discrepancies discovered have been resolved.

B. Preparation of Surfaces:

3.8 CLEAN-UP

A. At time of acceptance, fixtures shall be clean, with visible labels removed. Touch-up any blemishes at completion of work.

B. Remove ballast leakage and dispose of cleaning materials in accordance with EPA regulations.

3.9 FIXTURES AS RACEWAYS

A. Code Reference: NEC 410-31

B. Through-Wiring: In continuous rows of lighting, a connection to a single point in the row indicates that the branch circuit conductors are to be routed through the fixture wiring compartments and a connection made to each ballast.

3.10 EXTRA STOCK

A. Provide extra replacement LED driver(s) for each fixture type in project. Quantity: 10%. Where a fraction occurs, round up to next larger integer.

END OF SECTION

SECTION 28 31 10 – DELEGATED-DESIGN FIRE DETECTION AND ALARM

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. Fire Detection and Alarm system shall be provided by design-build subcontractor as follows:

1. Fire Detection and Alarm Systems Contractor shall provide for and obtain all necessary permits and inspections as required from regulatory agencies.
2. Fire Detection and Alarm Systems Contractor shall be the permit holder and shall be responsible for the proper design and installation of the mechanical systems for the entire renovated space.
3. All Detection and Alarm Systems work shall be Bidder design-build and shall comply with all governing code requirements.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Fire Detection and Alarm Systems Contractor shall provide:

1. Product data for all Detection and Alarm system components and devices. Detection and Alarm Systems to be compatible with existing American Plaza Towers Systems in adjacent buildings.
2. Shop drawings as required for design review by Architect, permitting, and construction.

B. At completion, provide the following:

1. O&M manual for devices installed.
2. The contractor shall submit as-built drawings as AutoCAD files to the Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For system warranty.

1.6 FIELD CONDITIONS

A. Field Conditions and Measurements: Verify all existing conditions and dimensions to effectively locate all components and devices of systems in relation to existing and new systems.

1.7 QUALITY ASSURANCE

A. Fire Alarm and Detection Contractor shall coordinate requirements with the intent of the Documents; Fire Alarm and Detection Contractor shall perform calculations to verify quantity and location of devices.

B. Coordinate work with all electrical, plumbing and mechanical work on the Project.

C. Qualifications: Fire Alarm and Detection designers and installers shall be trained and certified for systems and equipment being provided and installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide Alarm and Detection components and device of code-required materials and properly sized for the code required system.

B. Provide devices to match existing American Plaza Tower complex standard.

PART 3 - EXECUTION

3.1 GENERAL

A. Conceal conduit and junction boxes to the fullest extent possible. Where conduit or junction boxes cannot be concealed, notify the Architect and coordinate locations to be as unobtrusive as possible.

END OF SECTION 28 31 10