replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

B. Extended Maintenance Support and Service Agreement: Submit for Owner's consideration an optional extended Service Agreement for the installed automatic door operator system. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.

1. A published copy of this agreement to be included with the submittal package
2. Support for the installed automatic door operator system is provided through the vendor under a specified, limited 24 hour support program.
3. Automatic door operators and components are to be available on a one-day turn around time frame from the vendor.

PART 2 - PRODUCTS

2.1 ELECTROMECHANICAL DOOR OPERATORS – GENERAL

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Besam Automated Entrance Systems (BE) - SW100 Series.
2. Horton Automatics (HO) - 7000 Series.
3. LCN Closers (LC) - 9100 Series.

2.2 LOW ENERGY DOOR OPERATORS

A. Standard: Certified ANSI/BHMA A156.19.

1. Performance Requirements:

a. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
b. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

B. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

C. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

D. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

1. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

2.3 ACTIVATION DEVICES

A. General: Provide activation devices in accordance with ANSI/BHMA A156.19 standard, for condition of exposure indicated and for long term, maintenance free operation under normal traffic load operation. Coordinate activation control with electrified hardware and access control interfaces. Activation switches are standard SPST, with optional DPDT availability.

B. Push-Plate Switch: Momentary contact door control switch with push-plate actuator.

1. Configuration: Square or round push-plate control switch with single or double gang junction box mounting. Provide narrow profile face plate where indicated for jamb or mullion mounting.

a. Mounting Location: As indicated on Drawings.

2. Push-Plate Material: Stainless steel.
3. Message: International symbol of accessibility with "Push (Press) to Open (Operate)" text.
4. Acceptable Manufacturers:

    a. Alarm Controls (AK) – JP1 Series.
    b. BEA Sensors (BS) – PBS45 Series.
    c. Camden Door Controls (CM) – CM45/46 Series.
    d. Norton Door Controls (NO) – 500 Series.
    e. Wikk Industries (WI) – 4x4 Series.
    f. {Other}

C. Key Switch: Key controlled actuator device enclosed in single or double gang junction box.

1. Faceplate Material: Stainless steel.
2. Functions: On-off, maintained contact.
3. Two-way Mounting: Recess or surface mounting as indicated on Drawings.
4. Acceptable Manufacturers:

    a. Alarm Controls (AK) – MCK Series.
    b. Securitron (SU) – MKA Series.
    c. Wikk Industries (WI) – KS Series.

2.4 ACCESSORIES

A. Signage: As required by cited ANSI/BHMA A156.19 standard for the type of operator.

2.5 FINISHES

A. Standard: Designations used to indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware. Units will be sprayed with a combination of waterborne acrylic and polyester powder coat.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, power connections, electrical systems interfaces, and other conditions affecting performance of automatic door operators.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 INSTALLATION

A. General: Install complete automatic door operators according to manufacturer's written instructions and ANSI/BHMA A156;19 standard, including activation devices, control wiring, remote power units if any, connection to the building's fire alarm system, and required signage.

B. Power Connection: Reference Division 26 "Electrical" Sections for connection to electrical power distribution system.

C. Access Control System: Coordinate connections and operation with access control system

D. Signage: Apply signage as required by ANSI/BHMA A156.19 standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

A. Inspection: Certified Installer' representative to inspect and test automatic door operators to determine compliance of installed systems with specifications and ANSI/BHMA A146.19 standard. Report discrepancies in writing to Architect and Contractor within 24 hours after inspection.

3.4 ADJUSTING

A. Comply with requirements of ANSI/BHMA A156.19 standard. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer.

3.5 DEMONSTRATION

A. Certified Installer's representative to provide eight (8) hours of training to Owner's maintenance personnel in the proper adjustment, operation, and maintenance of automatic door operators.

END OF SECTION 087113

SECTION 08 8000 - 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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Storefront framing.
4. Glazed entrances.
5. Glazed aluminum curtain walls.
6. Interior borrowed lites.

1.3 Related Sections include the following:

1. Section 064023 "Interior Architectural Woodwork", for display case glass doors.

1.4 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. Interspace: Space between lites of an insulating-glass unit.

1.5 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC's 2003 International Building Code by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawing Sheet S1.0.
2. Glass Type Factors for Wired, Patterned, and Sandblasted Glass:

a. Short-Duration Glass Type Factor for Wired Glass: 0.5.
b. Long-Duration Glass Type Factor for Wired Glass: 0.3.

3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
5. Structural Loads:

a. Blast Loads: Designed to meet UFC 4-010-01, dated October 8, 2003 including Change 1, dated January 22, 2007 including Appendix B-3.1, Standard 10:

1) Applicable Explosive Weight: I.
2) Conventional Standoff Distance: 45m- (148 ft.).
3) Location: Parking and Roadways without a Controlled Perimeter
4) Building Category: Primary Gathering Building.

6. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.6 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

1. Laminated glass with clear interlayer.
2. Insulating glass.

C. Glazing Accessory Samples: For gaskets, in 12-inch (300-mm) 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. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For installers.

G. Product Certificates: For glass and glazing products, from manufacturer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-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. Source Limitations for Glass: Obtain tinted float glass, coated float glass, laminated glass, and insulating glass from single source from single manufacturer for each glass type.

E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

F. 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 Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

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 recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Final Completion Certificate issuance.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Final Completion Certificate issuance.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Final Completion Certificate issuance.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.

2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
2. Spacer: Manufacturer's standard spacer material and construction.

B. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: 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.

2.7 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.

2.8 MONOLITHIC-GLASS

A. Clear fully tempered float glass.

1. Thickness:

a. Typical: 1/4- inch (6.35 mm).

2. Provide safety glazing labeling.

2.9 LAMINATED-GLASS

A. Clear laminated glass with two plies of fully tempered float glass.

1. Thickness of Each Glass Ply: 1/8-inch (3.35 mm).
2. Interlayer Thickness: 0.090 inch (2.29 mm).
3. Provide safety glazing labeling.

2.10 INSULATING-GLASS

A. Clear fully tempered insulating glass.

1. Overall Unit Thickness: 1 inch (25 mm) minimum.
2. Thickness of Each Glass Lite: 1/4-inch (6.35 mm).
3. Outdoor Lite: Clear fully tempered float glass.
4. Interspace Content: Air. ½ inch (12.70 mm) minimum.
5. Indoor Lite: Clear fully tempered, laminated float glass.
6. Low-E Coating: Pyrolytic on surface #3.
7. Transmittance:

   a. Visible Light: 70 percent.
   b. Solar Energy: 33 percent.
   c. UV: 10 percent.

8. Reflectance:

   a. Visible Light – Exterior: 11 percent.
   b. Visible Light – Interior: 12 percent.
   c. Solar Energy: 31 percent.

9. U-Value:

   a. Winter Nighttime: 0.29 Btu/(hr. x sq. ft. x deg. F).
   b. Summer Daytime: 0.26 Btu/(hr. x sq. ft. x deg. F).

10. Shading Coefficient: 0.44.
11. Relative Heat Gain: 91 Btu/hf x sq. ft.
12. Solar Factor (SHGC): 0.30.
13. LSG: 1.85.
14. Provide safety glazing labeling.

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. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.

4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 will 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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

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 (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. 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.

C. 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.

D. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 8000

SECTION 08 8300 - MIRRORS

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 types of silvered flat glass mirrors.

1. Film-backed glass mirrors qualifying as safety glazing.

B. Related Sections include the following:

1. Division 10 Section "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 DEFINITIONS

A. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.4 PERFORMANCE REQUIREMENTS

A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
2. Mirror mastic.
3. Mirror hardware.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples: For each type of mirror product required, in the form indicated below:

1. Mirrors, 12 inches (300 mm) square, including edge treatment on 2 adjoining edges.
2. Mirror trim, 12 inches (300 mm) long.

D. Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.

E. Qualification Data: For Installer.

F. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing paint and substrates on which mirrors are installed.

G. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under NGA's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.

C. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.

D. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

E. Safety Glazing Products: For tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing paint and substrates on which mirrors are installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:

1. Warranty Period: Five years from date of Final Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mirrors that may be incorporated into the Work include, but are not limited to, the following:

1. Arch Aluminum & Glass Co., Inc.
2. Gardner Glass Products.
3. Gilded Mirrors, Inc.
4. Guardian Industries Corp.
5. Independent Mirror Industries, Inc.
6. Lenoir Mirror Company.
7. Messer Industries, Inc.
8. Stroupe Mirror Co., Inc.
9. Sunshine Mirror.
10. Virginia Mirror Company, Inc.
11. VVP America, Inc.; Binswanger Mirror Products.
12. Walker Glass Co., Ltd.

2.2 SILVERED FLAT GLASS MIRROR MATERIALS

A. Clear Glass: Mirror Glazing Quality.

1. Nominal Thickness: 6.0 mm.

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.

B. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Gunther Mirror Mastics.
   b. Palmer Products Corporation.

2. VOC Content: Not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.4 MIRROR HARDWARE

A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.05 inch (1.3 mm).
2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.062 inch (1.57 mm).
3. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Bottom Trim:

      1) Laurence, C. R. Co., Inc.; CRL Standard "J" Channel.
      2) Sommer & Maca Industries, Inc.; Medium Gauge Aluminum Shallow Nose "J" Moulding Lower Bar.
      3) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Shallow Nose "J" Moulding Lower Bar.

   b. Top Trim:

      1) Laurence, C. R. Co., Inc.; CRL Deep "J" Channel.
      2) Sommer & Maca Industries, Inc.; Medium Gauge Aluminum Deep Nose "J" Moulding Upper Bar.
      3) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Deep Nose "J" Moulding Lower Bar.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

D. Safety Glazing Film: Optically clear, tear-resistant, penetration-resistant, and abrasion-resistant polyester film with pressure-sensitive adhesive; minimum 0.007 inch (7 mil) thickness.

2.5 FABRICATION

A. Mirror Sizes: To suit Project conditions cut mirrors to final sizes and shapes. Provide in the sizes indicated on Drawings

B. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.

1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
2. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. For wall-mounted mirrors, install mirrors with mastic and mirror hardware.

1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
2. For mirror hardware in the form of continuous J-channels at bottom, provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, 2 slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long.
3. Install mirror hardware in the form of J-channels that are fabricated in single lengths to fit and cover top and bottom edges of mirrors.
4. Install mastic as follows:

a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.

b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08 8300

SECTION 089119 - FIXED LOUVERS

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. Fixed, extruded-aluminum louvers

B. Related Requirements:
1. Section 099113 "Exterior Painting" for field painting louvers.
2. See Division 5 Section "Structural Metal Framing" for structural framing supporting louver sections.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 PERFORMANCE REQUIREMENTS

A. Design: Design louvers, including comprehensive engineering analysis by a qualified engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on a uniform pressure of 30 lb./sq. ft. (1435 Pa), acting inward or outward.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Windborne-debris-impact-resistance test reports.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of structural frame by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Nondrainable-Blade Louver:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Architectural Louvers, V4JS, or comparable product by one of the following:

a. Architectural Louvers; Harray, LLC.
b. Greenheck Fan Corporation.
c. or approved.

2. Louver Depth: 4 inches100 mm.
3. Blade Profile: 45 Degree Inverted J Blade. Plain blade without center baffle.
4. Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).
5. Framing Support Nominal Thickness: Not less than 0.125 inch (3.2 mm)
6. Louver Performance Requirements:
   a. Free Area: Not less than 8.0 sq. ft. (0.74 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver assembly.

b. Horizontal Drag Coefficient: Not greater than 0.63 on a cross sectional profile, allowing for a 37% reduction in wind load imposed horizontally upon supporting structural framing.

2.4 MATERIALS

A. Aluminum Extrusions: ASTM B 221ASTM B 221M, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209M, Alloy 3003 with temper as required for forming.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use [Phillips flat-head] [hex-head or Phillips pan-head] [tamper-resistant] screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern where indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches 1830 mm o.c., whichever is less.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.6 FINISHES

A. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for 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. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

SECTION 09 2216 - 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 gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

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."

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. 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. G90 (Z275) hot dip galvanized at shower ceilings.

C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
b. Depth: As indicated on Drawings.

2. Dimpled Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.015 inch (0.38 mm).
b. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
2. 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.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) Steel Network Inc. (The); VertiClip SLD Series.
3) Superior Metal Trim; Superior Flex Track System (SFT).

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
2. Depth: As indicated on Drawings.

G. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Hat shaped.

H. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.2 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Postinstalled, chemical anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm)].
b. Depth: As indicated on Drawings.

3. Dimpled Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.015 inch (0.38 mm).
b. Depth: As indicated on Drawings.

4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.

a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).

5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

a. Configuration: Hat shaped.

F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized. G90 (Z275) hot dip galvanized at shower ceilings.

2. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.

b. Chicago Metallic Corporation; Drywall Grid System.
c. USG Corporation; Drywall Suspension System.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

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. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. 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 (406 mm) o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches (406 mm) 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 penetrating 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 (13-mm) 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.

E. Z-Furring Members:

1. Erect insulation, specified in Division 07 Section "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches (610 mm) 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 (610 mm) 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 (305 mm) from corner and cut insulation to fit.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

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.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. 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 (3 mm in 3.6 mm) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 2216

SECTION 09 3000 – TILING & SHOWER 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. Porcelain tile.
2. Metal edge strips
3. Shower pan
4. Splash guard
5. Recessed shower Shelves

B. Related Sections:

1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.5, ANSI A108.10, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.

2. Metal edge strips in 6-inch (150-mm) lengths.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Material Test Reports: For each tile-setting and -grouting product.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Joint sealants.
2. Metal edge strips.

D. Preinstallation Conference: Conduct conference at location determined by owner and Architect.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Glazed porcelain tile.

1. Manufacturers: Subject to compliance with requirements, provide, or comparable American made product if approved by Architect prior to bidding.

a. American Olean. (Basis of Design).
b. Daltile.
c. Ceasar.

2. Product: American Olean- Rapport

a. Composition: Glazed porcelain – through-body.
b. Module Size: Floor Tile 12 by 24 inches & 2x4 Mosaic (Shower Floor Only)
c. Trim: Provide 3x12 Bullnose , 6 x 12 Cove Base throughout, & Cove Outercorner
d. Thickness: 3/8 inch (Floor)
a) Floor Tile 3/8”
b) Mosaic ¼”
e. Tile Color: As selected by Architect from manufacturer's full range.
f. Grout Color: As selected by Architect from manufacturer's full range.
g. Grout Size: 3/32”

2.3 TILE/SHOWER COMPONENTS

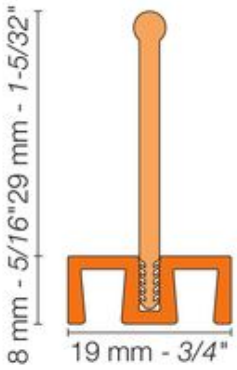
A. Recessed Shower Shelves.

1. Product: SHOWER SHELF
a. Ready Niche - Double Niche Double Recessed Shelf (Basis of Design).
b. Composition: Glazed porcelain – through-body.
c. Size:16”x20”x4”

2. Product: SHOWER PAN
a. American Olean- Tile Redi Base Barrier Free/Center Drain
b. Size: 38”x38”x1”
c. Ref. Drawings for details.

3. Product: FLASHING
a. Redi Flash -Waterproofing System:
b. Material: Pre-formed aluminum guard
c. Height: 3”
d. Width: Reference drawings for appropriate size and details.

4. Product: SPLASHGAURD
   a. Schluter Shower Dam –Showerprofile-WSL Straight lip



SHOWERPROFILE-WS + -WSL

2.4 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Bonsal American; an Oldcastle company.
   b. C-Cure.
   c. Custom Building Products.
   d. Laticrete International, Inc.
   e. MAPEI Corporation.
   f. TEC; a subsidiary of H. B. Fuller Company.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.5 GROUT MATERIALS

A. Modified Tile Grout: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, provide product from one of the following manufacturers:

a. Bostik.; TruColor, pre-mixed grout (Basis of Design).
b. Laticrete International, Inc., Quartzlock
c. MAPEI Corporation.
d. TEC; a subsidiary of H. B. Fuller Company.

2. Type: Water-based, urethane grout.

3. Product shall contain integral grout sealer.

2.6 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Wall Tile: 3/32 inch

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.4 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.5 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Masonry or Concrete:

1. Tile Installation W202: Thin-set mortar, TCA W202.

a. Tile Type: Glazed Porcelain tile.

b. Floor Mosaic- Cut and slope as indicated in drawings.

c. Tile Recessed Shower Shelves.
d. Thin-Set Mortar: Latex- portland cement mortar.
e. Grout: Water-based pre-mixed grout.

END OF SECTION 09 3000

SECTION 09 5113 - ACOUSTICAL PANEL 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 acoustical panels and exposed suspension systems for ceilings.

1.3 PREINSTALLATION MEETINGS

A. Pre-Installation Conference for Acoustical Panel Ceilings: Prior to start of work in areas scheduled for ceiling installation, conduct conference at Project to comply with requirements of applicable Division 01 Sections.

1. Required Attendees:
   a. Architect.
   b. Contractor, including supervisor.
   c. Ceiling installer, including supervisor.

2. Minimum Agenda: Installer shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, the following:

   a. Tour representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of procedures, and other preparatory work performed by other installers.
   b. Review Contract Document requirements.
   c. Review approved submittals.
   d. Review procedures, including, but not limited to:

      1) Environmental requirements.
      2) Scheduling and phasing of work.
      3) Coordinating with other work and personnel.
      4) Protection of adjacent surfaces.
      5) Surface preparation.
      6) Repair of defects and defective work prior to installation.
      7) Suspension system requirements.
      8) Seismic restraint requirement compliance.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- (150-mm-) square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- (150-mm-) long Samples of each type, finish, and color.

1.5 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. Suspended ceiling components.
2. Size and location of initial access modules for acoustical panels.
3. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. AV equipment.

4. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 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 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling and clouds shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Design Criteria for building and components: Refer to Structural Drawing Sheet S1.00 for Seismic Design Criteria.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.

D. Substrate: Water-felted mineral fiber.

E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

2.3 ACOUSTICAL PANELS “Type 1”

A. Manufacturer: Subject to compliance with requirements, provide product by one of the following:

1. USG, (Basis of Design)
2. Chicago Metallic Corporation.
3. Armstrong

B. Product: Armstrong, Fissured

C. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 1, nodular.
2. Pattern: CE (perforated, small holes and lightly textured).

D. Color: White.

E. LR: Not less than 0.81.

F. NRC: Not less than 0.55.

G. CAC: Not less than 33.

H. Edge/Joint Detail: Angled Tegular.

I. Thickness: 5/8 inch.

J. Modular Size: 24 by 24 inches (610 by 610 mm).

K. Grid: DX/DXL 15/16” XL, Color white.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 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 in ASTM C 635/C 635M.

1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
4. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.

D. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. 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 ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.5 METAL SUSPENSION SYSTEM

A. Manufacturer: Subject to compliance with requirements, provide product by one of the following:

1. USG, (Basis of Design).
2. Chicago Metallic Corporation.
3. Armstrong.

B. Product: USG 15/16” DX/DXL

C. Wide-Face, Capped, Double-Web,Hot-Dip Galvanized, G60 (Z180), Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized according to ASTM A 653/A 653M, G60 (Z180) coating designation; with prefinished, cold-rolled, 15/16-inch- (24-mm-) wide aluminum caps on flanges.

1. Structural Classification: Heavy-duty system.
2. Seismic RX Suspension System.
3. Face Design: Flat, flush.
4. Face Finish: Painted white.

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. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. 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

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook." and “Guidelines for Seismic Restraint for Direct Hung Suspended Ceiling Assemblies, Seismic Zones 3 and 4”.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of 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. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. 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.

10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
11. Use manufacturer installation guidelines for panels designated to be installed on a slope.

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. Arrange directionally patterned acoustical panels as follows:

a. As indicated on reflected ceiling plans.
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. 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.

3.4 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 09 5113

SECTION 096513 - 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 01Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.
3. Resilient Tile Flooring.
4. Resilient Stair treads, risers and nosings.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

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 PROJECT 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 time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. 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.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. 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.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Roppe Corporation, USA.
   b. Johnsonite

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: As selected by Architect from manufacturer's full range.

I. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Roppe Corporation, USA.
   b. Johnsonite

B. Description: Carpet edge for glue-down applications, Nosing for carpet, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet, Transition strips.

C. Material: Rubber.

D. Profile and Dimensions: As indicated or required for indicated floor finishes.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 VINYL COMPOSITION FLOOR TILE

A. Products: Provide Products by:
1. Armstrong World Industries, Inc.; Standard Excelon – Multicolor & Imperial Texture.

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches .

F. Colors and Patterns: As selected by Architect from full range of industry colors.
1. Allow for up to 4 colors Random Pattern, evenly distributed.
a. 40% Color 1
b. 40% Color 2
c. 10% Color 3
d. 10% Color 4

2.4 STAIR TREAD, RISERS AND NOSINGS

A. Rubber Stair Treads with Riser:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Armstrong
b. Roppe Corporation, USA.
c. Johnsonite (Basis of Design)

B. Johnsonite Rubber tread with Riser
1. Color (select one)
a. SafeTcork Cork/Rubber Tile, complies with ASTM F 2169, Type TS a. Style # 93 Texture Design, color as decided by Architect 1.) Complies with ASTM F 2169, Type TS, Class 2 (Patterned)
b. Tread Finish: Hammered
c. Risers: Angled (reference drawings)
d. 2.) Length-As required. Field Verify
e. 3.) Depth: 12 5/8” (314.3mm) nominal from inside of nose.
f. 4.) Thickness: 13/64” (5.15mm) tapering to 5/32” (3.97mm) nominal
g. 5.) Square Nose Length: Heavy Duty Square nose length
h. 6.) Nose Thickness: 5/32” (3.97mm) nominal
i. 7.) Tapered Nose: Yes
j. 8.) Relief Cut Nose: No
k. Color: Eco-Shell (Select from full line of colors

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 manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

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 practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop 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 until Substantial Completion.

E. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
1. Apply two coat(s).

F. Cover floor tile until Substantial Completion.

END OF SECTION 096513

SECTION 09 6813 - TILE CARPETING

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 modular, tufted carpet tile.

B. Related Requirements:
   1. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include installation recommendations for each type of substrate.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

   1. Carpet Tile: Full-size Sample.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 6-inch- (150-mm-) long Samples.

C. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for Silver, 37 to 51 points, based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.

D. Qualification Data: For Installer.

E. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.8 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.9 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. J&J, Invision (Basis of Design)
   b. Patcraft
   c. Tandus, C&A

B. Styles, as Selected by Architect from manufacturer's full range:
   1. J &J- Catwalk-off Modular

C. Color: As selected by Architect from manufacturer's full range.

D. Applied Soil-Resistance Treatment: Manufacturer's standard material.

E. Dye Method: 100 percent solution dyed.

F. Fiber Type: Nylon, "duracolor"

G. Pile Characteristic: Textured patterned loop

H. Gauge: 1/8"

I. Size: 24" x 24"

J. Backing System: Nexus Modular

K. Performance Characteristics: As follows:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
2. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
3. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
4. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
5. Resistance to Insects: Comply with AATCC 24.
6. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
7. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
8. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
9. Electrostatic Propensity: Less than **3.0** kV according to AATCC 134.
10. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.
11. Emissions: Provide carpet tile that complies with the 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."

2.2 CARPET TILE

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. J&J Invision (Basis of Design)
   b. Patcraft
   c. Lees

B. Style: J&J- Inception

C. Color: (2) Two Colors 50/50% As selected by Architect from manufacturer's full range.

D. Applied Soil-Resistance Treatment: Manufacturer's standard material.

E. Dye Method: 100 percent solution dyed.

F. Fiber Type: BCF Nylon

G. Pile Characteristic: Pattern Loop

H. Gauge: 1/10

I. Size: 18” x 36”

J. Backing System: Nexus Modular

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives 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."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

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 (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. 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 carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove yarns that protrude from carpet tile surface.
2. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 6813

SECTION 096900 - ACCESS 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. Section Includes:

1. Access-flooring panels.
2. Understructure.
3. Floor panel coverings.

1.3 COORDINATION

A. Coordinate location of mechanical and electrical work in underfloor cavity to prevent interference with access-flooring pedestals.

B. Mark pedestal locations on subfloor using a grid to enable mechanical and electrical work to proceed without interfering with access-flooring pedestals.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include layout of access-flooring system and relationship to adjoining Work based on field-verified dimensions.

1. Details and sections with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, and understructures.

C. Samples for Verification: For the following products:

1. Floor Covering: Full-size units.
2. Exposed Metal Accessories: Approximately 10 inches in length.
3. One complete full-size floor panel, pedestal, and understructure unit for each type of access-flooring system required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of access-flooring system.

C. Product Test Reports: For each type of flooring material and exposed finish, for tests performed by a qualified testing agency.

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. Flooring Panels: 5%
2. Pedestals: 5%

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install access flooring until spaces are enclosed, ambient temperature is between 50 and 90 deg F, and relative humidity is not less than 20 and not more than 70 percent.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Access flooring shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Fire Performance:

1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
2. Combustion Characteristics: ASTM E 136.

2.2 MANUFACTURERS

A. Source Limitations: Obtain access-flooring system from single source from single manufacturer.

2.3 FLOOR PANELS

A. Floor Panels, General: Provide modular panels interchangeable with other field panels without disturbing adjacent panels or understructure.

1. Size: Nominal .
2. Attachment to Understructure: .
3. One-to-One Carpet Tile: Fabricate panels to accept one-to-one carpet tile.

B. Wood-Core Steel Panels: Fabricated with 1-inch- thick particleboard core, made without urea formaldehyde laminated to top and bottom steel face sheets, with metal surfaces protected against corrosion by manufacturer's standard factory-applied finish, and with a flame-spread index of 25 or less according to ASTM E 84. Provide core edges enclosed with upturned, die-formed, bottom-sheet edge or with perimeter steel channel welded to top sheet and welded or bonded to bottom sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by the following;
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
   a. Tate Access Floors, Inc.(Basis of Design)
   b. ASM Modular Systems, Inc.
   c. Bergvik North America, Inc.
   d. Camino Modular Systems, Inc.
   e. Computer Environments, Inc.

2.4 PRODUCT

A. Access floor system shall be manufactured by Tate Access Floors, Inc. and shall consist of Woodcore WC5000 access floor panels supported by a cornerlock understructure system.

2.5 UNDERSTRUCTURE

A. Pedestals: Assembly consisting of base, column with provisions for height adjustment, and head (cap); made of steel.

1. Provide pedestals designed for use in seismic applications.
2. Base: Square or circular base with not less than 16 sq. in. of bearing area.
3. Column: Of height required to bring finished floor to elevations indicated. Weld to base plate.
4. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than 2 inches and for locking at a selected height, so deliberate action is required to change height setting and prevent vibratory displacement.
5. Head: Designed to support the panel system indicated.

a. Provide sound-deadening pads or gaskets at contact points between heads and panels.
b. Bolted Assemblies: Provide head with four holes aligned with holes in floor panels for bolting of panels to pedestals.

2.6 FABRICATION

A. Fabrication Tolerances:

1. Size: Plus or minus 0.020 inch of required size.
2. Squareness: Plus or minus 0.015 inch between diagonal measurements across top of panel.
3. Flatness: Plus or minus 0.035 inch, measured on a diagonal on top of panel.

B. Panel Markings: Clearly and permanently mark floor panels on their underside with panel type and concentrated-load rating.

C. Bolted Panels: Provide panels with holes drilled in corners to align precisely with threaded holes in pedestal heads and to accept countersunk screws with heads flush with top of panel.

1. Captive Fasteners: Provide fasteners held captive to panels.

D. Cutouts: Fabricate cutouts in floor panels for cable penetrations and service outlets. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with structural performance requirements.

1. Number, Size, Shape, and Location: As indicated.
2. Grommets: Where indicated, fit cutouts with manufacturer's standard grommets; or, if size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding with tapered top flange.
3. Provide foam-rubber pads for sealing annular space formed in cutouts by cables.

2.7 ACCESSORIES

A. Service Outlets: Standard UL-listed and -labeled assemblies, for recessed mounting flush with top of floor panels; for power, communication, and signal services; and complying with the following requirements:

1. Structural Performance: Cover capable of supporting a [300-lbf] [800-lbf] [1000-lbf] concentrated load.

2. Cover and Box Type:
3. Location: In center of panel quadrant unless otherwise indicated.
4. Receptacles and Wiring: Electrical receptacles and wiring for service outlets are specified elsewhere.
5. Receptacles and Wiring: Equip each service outlet with power receptacles to comply with the following requirements:

    a. Type of Receptacle: Heavy-duty duplex, two-pole, three-wire grounding, 20 A, 125 V, NEMA WD 6, Configuration 5-20R unless otherwise indicated.
    b. Number of Receptacles for Outlet: Four.
    c. Wiring Method: Factory wired for hardwiring in field with armored cable, containing three insulated No. 12 AWG solid-copper conductors, terminated with a 6-inch- long pigtail.
    d. Wiring Method: Power-in connectors, built into outlet housing, of type to fit power-in and power-out connectors of branch-circuit cables supplied with building electrical system.

B. Closures: Where underfloor cavity is not enclosed by abutting walls or other construction, provide metal-closure plates with manufacturer's standard finish.

C. Panel Lifting Device: Panel manufacturer's standard portable lifting device for each type of panel required for each computer room.

D. Perimeter Support: Where indicated, provide manufacturer's standard method for supporting panel edge and forming transition between access flooring and adjoining floor coverings at same level as access flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, foreign deposits, and debris that might interfere with attachment of pedestals.
2. Verify that concrete floor sealer and finish have been applied and cured.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out floor panel installation to keep the number of cut panels at floor perimeter to a minimum. Avoid using panels cut to less than 6 inches.

B. Locate each pedestal, complete any necessary subfloor preparation, and vacuum subfloor to remove dust, dirt, and construction debris before beginning installation.

3.3 INSTALLATION

A. Install access-flooring system and accessories under supervision of access-flooring manufacturer's authorized representative to produce a rigid, firm installation that complies with performance requirements and is free of instability, rocking, rattles, and squeaks.

B. Adhesive Attachment of Pedestals: Set pedestals in adhesive, according to access-flooring manufacturer's written instructions, to provide full bearing of pedestal base on subfloor.

C. Mechanical Attachment of Pedestals: Attach pedestals to subfloor with post-installed mechanical anchors.

D. Adjust pedestals to permit top of installed panels to be set flat, level, and to proper height.

E. Stringer Systems: Secure stringers to pedestal heads according to access-flooring manufacturer's written instructions.

F. Install flooring panels securely in place, properly seated with panel edges flush. Do not force panels into place.

G. Scribe perimeter panels to provide a close fit with adjoining construction with no voids greater than 1/8 inch where panels abut vertical surfaces.

1. To prevent dusting, seal cut edges of steel-encapsulated, wood-core panels with sealer recommended in writing by panel manufacturer.

H. Cut and trim access flooring and perform other dirt-or-debris-producing activities at a remote location or as required to prevent contamination of subfloor under already-installed access flooring.

I. Grounded Flooring Access Panel Systems: Ground flooring system as recommended by manufacturer and as needed to comply with performance requirements for electrical resistance of floor coverings.

1. Panel-to-Understructure Resistance: Not more than 10 ohms as measured without floor coverings.

J. Underfloor Dividers: Scribe and install underfloor-cavity dividers to closely fit against subfloor surfaces, and seal with mastic.

K. Closures: Scribe closures to closely fit against subfloor and adjacent finished-floor surfaces. Set in mastic and seal to maintain plenum effect within underfloor cavity.

L. Clean dust, dirt, and construction debris caused by floor installation, and vacuum subfloor area as installation of floor panels proceeds.

M. Install access flooring without change in elevation between adjacent panels and within the following tolerances:

1. Plus or minus 1/16 inch in any 10-foot distance.
2. Plus or minus 1/8 inch from a level plane over entire access-flooring area.

3.4 PROTECTION

A. After completing installation, vacuum access flooring and cover with continuous sheets of reinforced paper or plastic. Maintain protective covering until time of Substantial Completion.

B. Replace access-flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

END OF SECTION 096900

SECTION 09 9113 - EXTERIOR 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 the application of paint systems on the following exterior substrates:

1. Steel.
2. Galvanized Metal.
3. Concrete Masonry Units.

B. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.

2. Division 08 Sections for shop priming of metal doors and frames.
3. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 SUBMITTALS

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

B. Samples for verification: For each type of topcoat product indicated.

C. 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.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Company
2. PPG Architectural Finishes, Inc.
3. Sherwin-Williams Company (The)

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 PRIMERS/SEALERS

2.4 METAL PRIMERS

A. Zinc-Rich Epoxy Primer: MPI #20.

B. Quick-Drying Alkyd Metal Primer: MPI #76.

C. Cementitious Galvanized-Metal Primer: MPI #26.

2.5 EXTERIOR ACRYLIC URETHANE PAINTS

A. Exterior Acrylic Urethane Enamel (Gloss): MPI #72 (Gloss Level 6).

2.6 EXTERIOR LATEX PAINTS

A. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

2.7 EXTERIOR QUICK-DRYING ENAMELS

A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5)

2.8 EXTERIOR WATERPROOF CONCRETE COATING

A. Coating for Exterior Concrete: Sherwin-Williams, ConFlex XL TM High Build Coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Structural Steel Substrates:

1. Polyurethane, pigmented, over Epoxy Coating System: MPI EXT 5.1P.

a. Prime Coat: Zinc-rich epoxy metal primer.
b. Intermediate Coat: Acrylic urethane matching topcoat.
c. Topcoat: Acrylic urethane (gloss).

B. Non-Structural Steel Substrates:

1. Quick-Drying Enamel System: MPI EXT 5.1A.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Quick-drying enamel matching topcoat.
c. Topcoat: Quick-drying enamel (semigloss).

C. Galvanized-Metal Substrates:

1. Latex System: MPI EXT 5.3A.

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Exterior Latex matching top coat..
c. Topcoat: Exterior latex (semigloss).

D. Concrete Stairway Steps, Landings and Stringers – New Statehouse Stair:

1. Coating for Exterior Concrete:

a. Prime Coat: High Build Elastomeric Waterproof Coating, Textured.
b. Topcoat: High Build Elastomeric Waterproof Coating, Textured.

END OF SECTION 09 9113

SECTION 09 9123 - INTERIOR 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. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Non-Polished Concrete.
2. Concrete masonry units (CMU).
3. Steel.
4. Galvanized metal.
5. Gypsum board.

B. Related Requirements:

1. Division 03 Section “Polished Concrete Finishing” for sealing polished concrete floors.
2. Division 09 painting Sections for high-performance and special-use coatings.
3. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) 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.

C. 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.
3. VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 2 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.5 QUALITY ASSURANCE

A. MPI

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. ICI Paints.
3. Kwal Paint.
4. PPG Architectural Finishes, Inc.
5. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

D. Low-Emitting Materials: Interior paints and coatings 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."

E. Colors: As selected by Architect from manufacturer's full range.

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.

2.4 PRIMERS/SEALERS

A. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.

B. Primer Sealer, Alkyd, Interior: MPI #45.

2.5 METAL PRIMERS

A. Primer, Alkyd, Anti-Corrosive, for Metal: MPI #79.

B. Primer, Alkyd, Quick Dry, for Metal: MPI #76.

C. Primer, Galvanized, Water Based: MPI #134.

2.6 WATER-BASED PAINTS

A. Latex, Interior, Institutional Low Odor/VOC, (Eggshell): MPI #145. (Gloss Level 3)

B. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Semigloss): MPI #147. (Gloss Level 5)

2.7 SOLVENT-BASED PAINTS

A. Alkyd, Interior, Semi-Gloss (Semigloss): MPI #47. (Gloss Level 5)

2.8 DRY FOG/FALL COATINGS

A. Latex Dry Fog/Fall: MPI #118.

2.9 FLOOR COATINGS

A. Sealer, Solvent Based, for Concrete Floors: MPI #104.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer**.**

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Structural, Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms and occupied spaces, including but not limited to, the following:

   a. Uninsulated plastic piping.
   b. Uninsulated metal piping.
   c. Pipe hangers and supports.
   d. Metal conduit.
   e. Tanks that do not have factory-applied final finishes.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
   h. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
      Exterior surfaces of all exposed ductwork; and mechanical, electrical and plumbing equipment, piping, cable trays and conduit and piping, and structural work in locations scheduled to receive dry fog/fall paint.
   i. Other items as directed by Architect.

2. Electrical Work:

   a. Switchgear.
   b. Panelboards.
   c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Contractor will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
   1. Contractor shall touch up and restore coated surfaces damaged by testing.
   2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Non-Polished Traffic Surfaces:

1. Solvent-Based Clear Sealer System: MPI INT 3.2F.

a. First Coat: Sealer, solvent based, for concrete floors.
b. Topcoat: Sealer, solvent based, for concrete floors.

B. CMU Substrates:

1. Latex System: MPI INT 4.2A.

a. Prime Coat: Interior/exterior latex block filler.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, (Gloss Level 3, Eggshell).

C. Steel Substrates:

1. Quick-Drying Enamel System (typical): MPI INT 5.1A.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Quick-drying enamel matching topcoat.
c. Topcoat: Quick-drying enamel (semigloss).

2. Water–Based Dry-Fall System: MPI INT 5.1A

a. Prime Coat: Waterborne dry fall.
b. Topcoat: Latex dry fog/fall or Waterborne dry fall.

D. Galvanized-Metal Substrates:

1. Latex over Waterborne Primer System: MPI INT 5.3J

a. Prime Coat: Primer, galvanized, water based.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5, Semigloss)

E. Wood Substrates: Including medium-density fiberboard, hardboard.

1. Latex System: MPI INT 6.4R.

a. Prime Coat: Interior latex-based wood primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex semigloss.

F. Gypsum Board Substrates:

1. Epoxy Latex System: MPI INT 9.2A.

a. Prime Coat: Interior latex primer/sealer.

b. Intermediate Coat: Interior latex epoxy matching topcoat.
c. Topcoat: Interior latex epoxy (satin).

2. Latex System: MPI INT 9.2A.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (eggshell).

END OF SECTION 09 9123

SECTION 099635 - SECONDARY CONTAINMENT COATING SYSTEM

PART 1 - GENERAL

1.1 Description

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as specified, shown, and required to furnish, install and place into satisfactory service the containment liner.
2. Types of containment lining for concrete Work required include, but are not necessarily limited to, the following:

    a. All system shall include substrate cleaning, surface preparation, and containment lining application. Materials and thicknesses shall be as specified herein.
    b. Cant cove bases shall be installed using mixed trowelable system as manufactured by Tnemec Co. in accordance with the Manufacturer's written instructions and as indicated on the Standard Secondary Containment Lining Detail.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed prior to application of the corrosion protection lining.
2. Coordinate and schedule preparation of substrates, before equipment and similar items are installed to avoid later difficulty or delay in performing the Work of this Section, and to provide substrates within tolerances and surface profile specified.
3. All substrate surface preparation and lining application, including concrete resurfacing, to be completed by manufacturer's approved Installer.

C. Related Sections:

1. Section 01300, Submittals.

1.2 References

A. This Section contains references to the governing standards and documents listed below. They are a part of this Section as specified and modified; the current version shall apply unless otherwise noted. In case of conflict between the requirements of this section and those of the listed documents, the more stringent of the requirements shall prevail.

1. American Concrete Institute, (ACI)

    a. ACI 301 – Specifications for Structural Concrete.
    b. ACI 308R – Guide to Curing Concrete.
    c. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary.
    d. ACI 546.R – Concrete Repair Guide.
    e. ACI 546.3R – Guide for the Selection of Materials for the Repair of Concrete

2. ASTM International, (ASTM)

   a. ASTM C307 – Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   b. ASTM C413 – Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   c. ASTM C531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   d. ASTM C579 – Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   e. ASTM C580 – Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   f. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
   g. ASTM D2047 – Standard Test Method for Static Coefficient of Friction of Polish–Coated Flooring Surfaces as Measured by the James Machine.
   h. ASTM D2240 – Standard Test Method for Rubber Property—Durometer Hardness.
   i. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Linings by the Taber Abraser.
   j. ASTM D4285 – Standard Test Method for Indicating Water or Oil in Compressed Air.
   k. ASTM D4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   l. ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
   m. ASTM D4541 – Standard Method for Pull-Off Strength of Coatings using Portable Adhesion Testers.
   n. ASTM D6944 Standard Test Method for Measuring Humidity with a Psychrometer.
   o. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

3. International Concrete Repair Institute, (ICRI)

   a. Guideline No. 310.1R – Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.
   b. Guideline No. 310.2 – Selecting and Specifying Concrete Surface Preparation for Sealer, Linings, and Polymer Overlays.

4. NACE International, (NACE)

   a. NACE Publication 6D-173 – A Manual for Painter Safety.
   b. NACE SP0892 – Standard Practice for Coatings and Linings over Concrete for Chemical Immersion and Containment Service.
   c. NACE No. 6/SSPC-SP13 – Surface Preparation of Concrete.

5. Occupational Safety and health Administration, (OSHA)

   a. Safety and health Standards (29 CFR 1910/1926).

6. SSPC: The Society for Protective Linings, (SSPC)

   a. SSPC-SP5/NACE No. 1 – White Metal Blast Cleaning
   b. SSPC-SP13/NACE No. 6 – Surface Preparation of Concrete.

c. SSPC-Guide 12 – Guide for Illumination of Industrial Painting Projects.
d. SSPC-QP1 Certification – Field Application to Complex Industrial and Marine Structures.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of receipt of Bids. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents, the last version of the document before it was discontinued.

1.3 Quality Assurance

A. Installer's Qualifications:

1. Installer shall have a minimum of 5 years experience in the application of the specified lining systems. Professional references will be required which Submit firm and qualifications of proposed Applicator to ENGINEER for approval.
2. Single Source Responsibility: Obtain primary resinous lining materials including primers, resins, hardening agents, finish, or sealing coats from a single manufacturer with not less than 5 years of successful experience in manufacturing principal materials described in this Section. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.
3. Installation shall be performed by an applicator having satisfactory experience in the application of these or similar materials or with on-site consultation by a qualified field service representative of the manufacturer.
4. Installer to establish quality control procedures and practices to monitor phases of surface preparation, storage, mixing, application, and inspection throughout the duration of the project. Contractor to provide a fulltime, on-site person whose dedicated responsibilities will include quality control of the containment liner.
5. Quality control procedures and practices must include the following items:

a. Training of personnel in the proper surface preparation requirements;
b. Training of personnel in the proper storing, mixing, application, inspection and repair of the corrosion protection lining.
c. Training of personnel in health and safety practices.

B. Mock-Ups:

1. Prior to the installation of the containment lining and auxiliary system components, but after Engineer's approval of the Samples, install 100 square foot stepped-back mock-ups of the systems showing each system component, in area selected by Engineer, to show representative installation of the Work.
2. Obtain Engineer's acceptance of visual qualities of the mock-ups before start of Work. Retain and protect mock-ups during construction as one standard for judging completed corrosion protection lining Work. Do not alter mock-ups after approval by Engineer.

a. Finished Work, in compliance with visual qualities of mock-ups, that fails other on-Site quality control testing procedures shall be replaced by Contractor with new materials.

3. Build as many mock-ups as required to achieve Engineer's acceptance of the corrosion protection lining.
4. Accepted mock-up shall be considered the acceptable minimum standard of quality.
5. Containment lining Work that proceeds without approved mock-ups shall be stopped, and mock-ups prepared for approval.

C. Pre-Installation Conference:

1. Before erecting mock-ups, Contractor, Installer and technical representative of the corrosion protection lining manufacturer shall meet on-Site with Engineer to discuss approved products and workmanship to ensure proper application of the corrosion protection lining components and substrate preparation requirements.
2. Review foreseeable methods and procedures related to the containment lining Work, including but not necessarily limited to, the following:

   a. Review Project requirements and the Contract Documents.
   b. Review required submittals, both completed and yet to be completed.
   c. Review status of substrate Work, including approval of surface preparations and similar considerations.
   d. Review requirements of on-Site quality control testing and requirements for preparing Site Quality Control Report as specified herein.
   e. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
   f. Review required inspection and testing.
   g. Review environmental conditions, other Project conditions, and procedures for coping with unfavorable conditions.
   h. Review regulations concerning code compliance, environmental protection, health, safety, fire and similar considerations.
   i. Review procedures required for the protection of the corrosion protection lining during the remainder of the construction period.

3. Record the discussions of the Pre-Installation Conference and the decisions and agreements or disagreements reached, and furnish a copy for the record to each party attending. Record any revision or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.
4. Reconvene the conference at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.

1.4 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300 entitled “Submittals”, the CONTRACTOR shall submit all required information as specified herein.

B. Submit for approval prior to commencing any Work:

1. Copies of specifications, technical information, installation instruction and general recommendations from the corrosion protection lining manufacturer for Work required. Include requirements for environmental conditions and other conditions required for an acceptable installation, providing features and performance as stated in manufacturer’s literature.
2. Submit to the Engineer for review in accordance with the General Requirements, complete shop drawings with the manufacturer's technical data showing complete methods of surface preparation and lining installation and general maintenance. Include plans and details of where and how chasing, coving, and expansion and control joints will be installed.
3. Submit three sets of 3-inch by 6-inch samples of containment liner in the finish texture and color required.

4. No lining work on site will be allowed until construction methods are approved and samples approved as to color and finish. All containment linings to be used shall conform to approved samples in all respects.
5. Product Data Sheets: Copies of current technical data for each component specified and applied as outlined in this Section.
6. Copies of Material Safety Data Sheets (MSDS) for all materials brought on-site to complete Work, including all clean-up solvents and containment lining materials.
7. Performance Testing Reports: Copies of test data for the entire physical, chemical, and permeation properties listed herein and as outlined within this Section.
8. Construction Details: Copies of manufacturer's computer generated standard lining details for specified materials, including: leading edge termination, metal embedment in concrete, joint detail, wall-to-slab detail, pipe termination detail, and any other detail at the request of the ENGINEER.
9. Product Substitution: The specified corrosion protection lining is the minimum standard of quality for this project. Equivalent materials of other manufacturers may be substituted only by approval of Engineer. Requests for material substitutions shall be in accordance with requirements of the project specification.

    a. Manufacturers of "or equal" products shall provide direct property comparison with the materials specified in addition to complying with all other requires of these Specifications. "Or equal" products shall employ the same generic materials and system components as the corrosion protection lining specified.
    b. Bidders desiring to use corrosion protection lining other than those specified shall submit proposed system with their proposal at the time of bid based, together with the information required herein, and indicate the sum which will be deducted from the base bid should alternate materials be accepted.

C. Jobsite Reports: Submit at the completion of Work

1. Daily Reports: Include surface preparation, substrate conditions, ambient conditions application procedures, lining materials applied, material quantities, material batch number(s), description of work completed and location thereof.

1.5 Product Delivery, Storage, and Handling

A. Delivery of Materials:

1. Deliver material in manufacturer's original, unopened and undamaged packages.
2. Clearly identify manufacturer's, brand name, contents, color, batch number, and any personal safety hazards associated with the use of or exposure to the materials on each package.
3. Packages showing indications of damage that may affect condition of contents are not acceptable.

B. Storage of Materials:

1. Materials shall be stored in accordance with manufacturer's recommendations in enclosed structures and shall be protected from weather. Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 degrees F and 90 degrees F.
2. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life as defined by the manufacturer shall be removed promptly from the site. Store all materials only in area or areas designated by the ENGINEER solely for this purpose.

3. Store in original packaging under protective cover off of the ground using pallets and protect from damage.
4. Stack containers in accordance with manufacturer's recommendations.

C. Handling of Materials: Handle materials in such a manner as to prevent damage to products or finishes.

1.6 Project Conditions

A. Environmental Requirements:

1. For containment lining, concrete substrate shall have cured a minimum of 28 days utilizing a dissipating curing membrane (water). If a curing compound is used on the slab, it must be completely removed prior to application of final topping, and compound and removal system must be approved in writing by topping manufacturer. Concrete sub floors on or below grade shall be adequately waterproofed beneath and at the perimeter of the slab.
2. Proceed with containment lining Work only when temperature and moisture conditions of substrates, air temperature, relative humidity, dew point and other conditions comply with the containment lining manufacturer's written recommendations and when no damaging environmental conditions are forecasted for the time when the material will be vulnerable to such environmental damage. Record all such conditions and include in final Site Quality Control Report.
3. Do not begin Work when relative humidity is expected to rise above 90 percent during the time of installation and catalyzation, nor when substrate temperature are not at least five degrees above the dew point temperature and rising.
4. Utilities, including electric, water, heat (air temperature between 65 degrees F and 90 degrees F), and finished lighting to be supplied by the general contractor.
5. Job area to be free of other trades during, and for a period of 24 hours, after lining installation.
6. Do not begin containment lining Work until manufacturer's recommended environmental conditions can be maintained and only when manufacturer and installer are willing to guarantee the Work as required and without additional reservations and restrictions.
7. Protection of finished walls and floor from damage by subsequent trade shall be the responsibility of the general contractor.

B. Dust and Contaminants: Protect work and adjacent areas from excessive dust and airborne contaminates during protective lining application and curing. Schedule Work to avoid excessive dust and airborne contaminants.

1.7 Warranty

A. Submit manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 Materials

A. Products and Manufacturers: Provide one of the following:

1. Tnemec Company, Inc., Kansas City, MO. Dustin Keilbey (816) 474-1616 www.tnemec.com, dkeilbey@tnemec.com

B. Products: Provide the following Containment Lining system:

1. Crack/Void/Bughole Repair – Tnemec Series 265 Elasto-Shield TG
2. Cant Cove – Tnemec Series 265 Elasto-Shield TG
3. Prime Coat – Tnemec Series 66 Epoxoline @ 2.0 – 6.0 mils DFT
4. Finish Coat – Tnemec Series 262 Elasto-Shield @ 50 – 100 mils DFT

PART 3 - EXECUTION

3.1 Inspection

A. Contractor shall examine the areas and conditions under which the corrosion protection coating Work is to be performed and notify Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until satisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Contractor shall confirm the presence of a positive side waterproofing on the exterior of the concrete structure where below grade.

3.2 Substrate Preparation

A. Concrete surfaces to be coated shall be free of curing compounds and form release agents, laitance and foreign particles that my inhibit bonding. Prior to start of protective lining systems application, high-pressure water clean, waterjet or abrasive blast surfaces to be covered as required, and inspect the substrate in accordance with SSPC-SP13/NACE No. 6. Surface preparation procedures shall be in accordance with SSPC-SP13/NACE No. 6 and ICRI Guideline No. 310.2. Surface preparation requirement is to expose aggregate and obtain a uniform surface texture resembling an ICRI-CSP 6.

B. All new cast-in-place and precast concrete shall cure for a period of 28 days in accordance with ACI 308R before protective lining system is installed, unless otherwise recommended by the Containment Lining manufacturer.

C. Concrete surfaces to receive protective lining shall be a Smooth Form Finish as defined in ACI 301. Surfaces shall not be rubbed, sacked, troweled or otherwise finished in any manner that will obscure or cover the firm substrate surface.

D. Level or grind concrete substrates to manufacturer’s recommended tolerances and produce a smooth, uniform installation, including removal of all sharp edges, ridges, or depressions.

E. All surfaces must be clean, dry and free of oil, grease and other contaminants, prior to preparation in accordance with SSPC-SP13/NACE No. 6. Concrete surfaces must be sound and capable of supporting the protective lining system as determined by the engineer. Surface preparation requirement is to expose a sound, uniform surface texture conforming to the minimum recommended ICRI-CSP. The appropriate surface/filler/patcher shall be applied to the prepared surface to condition the substrate making suitable for protective lining system.

3.3 Field Quality Control, Inspection, and Testing

A. Inspection by the Engineer or others does not limit the Contractor's responsibilities for quality control inspection and testing as specified herein or as required by the Manufacturer's instructions.

B. Contractor and his Installer shall examine the areas and conditions under which the containment lining Work is to be performed in accordance with SSPC-SP13/NACE No. 6 and notify Engineer in writing of conditions deleterious or otherwise detrimental to the proper and timely completion of the work.

C. Commencement of the Work of this Section shall indicate that the substrate and other conditions of installation are acceptable to the Contractor and his Installer, and will produce a finished product meeting the requirements of the Specifications. All defects resulting from such accepted conditions shall be corrected by Contractor at his own expense.

D. Dry-Film Thickness:

1. Wet-Film Thickness shall be taken every 100 square feet in accordance with ASTM D 4414 and recorded.
2. The Dry-Film Thickness can be determined using surface area calculation for material consumption.

3.4 Acceptance Criteria

A. All surfaces shall be prepared in accordance with the specification and referenced standards herein.

3.5 Adjustments and Cleaning

A. At the completion of the Work, Contractor shall remove all materials and debris associated with the Work of this Section.

B. Clean all surfaces not designated to receive protective lining. Restore all other work in a manner acceptable to Engineer.

C. Provide non-staining protective construction paper as approved over the entire surface area, with joints taped, and boards or planks where subjected to especially heavy traffic or hazards.

D. All finished protective lining shall be protected from damage until Final Acceptance of the Work. Protective lining damaged in any manner shall be repaired or replaced at the discretion of Engineer, at no additional cost to Owner.

E. Clean all protective lining as recommended by the manufacturer to provide finished Work acceptable to Owner just prior to Final Acceptance.

END OF SECTION

SECTION 10 1400 - 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. This Section includes the following:

1. Dimensional characters.
2. Plaques.
3. Panel signs.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
3. Division 23 Section "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
4. Division 26 Sections for electrical service and connections for illuminated signs.
5. Division 26 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
6. Division 26 Section "Interior Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:

1. Aluminum.
2. Acrylic sheet.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

1. Plaque Casting: 6 inches (150 mm) square including border.
2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element).
3. Aluminum: For each form, finish, and color, on 6-inch- (150-mm-) long sections of extrusions and squares of sheet at least 4 by 4 inches (100 by 100 mm).
4. Acrylic Sheet: 8 by 10 inches (200 by 250 mm) for each color required.
5. Panel Signs: Not less than 12 inches (305 mm) square.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Maintenance Data: For signs to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.

B. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

2.2 DIMENSIONAL CHARACTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACE Sign Systems, Inc.
2. Advance Corporation; Braille-Tac Division.
3. A. R. K. Ramos.
4. ASI-Modulex, Inc.
5. Bunting Graphics, Inc.
6. Charleston Industries, Inc.
7. Gemini Incorporated.
8. Grimco, Inc.
9. Innerface Sign Systems, Inc.
10. Metal Arts; Div. of L&H Mfg. Co.
11. Mills Manufacturing Company.
12. Mohawk Sign Systems.
13. Nelson-Harkins Industries.
14. Signature Signs, Incorporated.
15. Southwell Company (The).

B. Dimensional Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.

1. Character Material: Aluminum, clear anodic finish.
2. Thickness: ¾" @ 8" high, 1" @ 12" high, 1 ¼" @ 15" high, 1 ½" @ 18" or more high.
3. Mounting: Concealed studs, non-corroding for substrates encountered.
4. Font: Helvetica.

2.3 PLAQUES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Corporation; Braille-Tac Division.
2. A. R. K. Ramos.
3. Gemini Incorporated.
4. Matthews International Corporation; Bronze Division.
5. Metal Arts; Div. of L&H Mfg. Co.
6. Mills Manufacturing Company.
7. Nelson-Harkins Industries.
8. Southwell Company (The).

B. Exterior Cast Plaques at monument sign: Provide castings free of pits, scale, sand holes, and other defects, as follows:

1. Plaque Material: Cast aluminum.

2. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.
3. Background Texture: Manufacturer's standard texture.
4. Border Style: Square, polished.
5. Mounting: Concealed studs, noncorroding] for substrates encountered.
6. Design: As indicated on Drawings. Architect will provide electronic file.

2.4 PANEL SIGNS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACE Sign Systems, Inc.
2. Advance Corporation; Braille-Tac Division.
3. Allen Industries Architectural Signage
4. Allenite Signs; Allen Marking Products, Inc.
5. APCO Graphics, Inc.
6. ASI-Modulex, Inc.
7. Best Sign Systems Inc.
8. Bunting Graphics, Inc.
9. Fossil Industries, Inc.
10. Gemini Incorporated.
11. Grimco, Inc.
12. Innerface Sign Systems, Inc.
13. InPro Corporation
14. Matthews International Corporation; Bronze Division.
15. Mills Manufacturing Company.
16. Mohawk Sign Systems.
17. Nelson-Harkins Industries.
18. Seton Identification Products.
19. Signature Signs, Incorporated.
20. Supersine Company (The)

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:

1. Acrylic Sheet: 0.080 inch (2.03 mm) thick.
2. Edge Condition: Square cut.
3. Corner Condition: Rounded to radius indicated.
4. Mounting: Unframed.

   a. Wall mounted with two-face tape.
   b. Manufacturer's standard anchors for substrates encountered.

5. Custom Paint Colors: Match Pantone color matching system.
6. Color: As selected by Architect from manufacturer's full range.

7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.
8. Refer to signage schedule on drawings.

C. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of transparent covers with paper inserts printed by Owner.

1. Furnish insert material and software for creating text and symbols for Macintosh computers for Owner production of paper inserts.
2. Furnish insert material cut-to-size for changeable message insert.

D. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Clear acrylic sheet with opaque color coating, subsurface applied.
2. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).

E. Subsurface Copy: Apply minimum 4-mil- (0.10-mm-) thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free of rough edges.

F. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for three years for application intended.

1. Custom Paint Colors: Match Pantone color matching system.
2. Color: As selected by Architect from manufacturer's full range.

2.5 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.6 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a mill finish, complying with AAMA 611.

2.9 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for three years for application intended.

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 work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply. Signs mounted at doors with sidelights shall be mounted on the sidelight glass at the latch side of the door.

1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

C. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Flush Mounting: Mount characters with backs in contact with wall surface.

D. Cast Plaques: Mount plaques using mounting methods according to manufacturer's written instructions.

1. Install exterior wall plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 10 1400

SECTION 10 2113 - TOILET COMPARTMENTS

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. Solid plastic toilet compartments configured as toilet enclosures.
2. Urinal Screens

B. Related Sections:

1. Division 06 Section "Miscellaneous Rough Carpentry" for blocking.
2. Division 10 Section "Toilet, Bath, and Laundry Accessories".

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.
3. Show locations of centerlines of toilet fixtures.

C. Samples for initial selection: For each type of unit indicated. Include samples of hardware and accessories involving material and cost or selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment, from manufacturer.

B. Warranty: Sample of special warranty

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

B. Do not deliver toilet compartments to site until building is enclosed and HVAC systems are in operation.

1.8 WARRANTY

A. Special Manufacturer’s Warranty: Provide manufacturer’s standard form in which manufacturer agrees to repair or replace products that fail in material or workmanship during the following period after substantial completion:
1. Plastic Toilet Partitions: Against corrosion, breakage and delamination: 15 years.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface, [Class B].

B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.

C. Stainless Steel Sheet: ASTM A 240 or A 666, 300 series.

D. Stainless Steel Castings: ASTM A 743/A 743M.

E. Aluminum: ASTM B 221.

2.2 METAL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Accurate Partitions Corporation.
2. All American Metal Corp.
3. American Sanitary Partition Corporation.
4. Bradley Corporation; Mills Partitions. (Basis of Design: Sentinel, Series 400)
5. Flush Metal Partition Corp.
6. General Partitions Mfg. Corp.

B. Toilet-Enclosure Style: Floor anchored, overhead braced.

C. Urinal-Screen Style: 24 inch, wall hung with integral flanges.

D. Door, Panel, and Pilaster Construction, General: HDPE, with a 3/16" (4.8 mm) radiused edge.

1. Provide exposed surfaces free of pitting, visible seams and fabrication marks, stains, or other imperfections.
2. Provide aluminum heat sink at bottom edge of panels and doors.
3. Provide no-sightline system.

E. Door Construction: 1 inch (.7 mm) thick.

F. Panel Construction: 1 inch (.7 mm) thick.

G. Pilaster Construction: 1 inch (.85 mm) thick.

H. Headrail: Extruded anodized aluminum headrail with anti-grip profile. Clamps around pilaster and is secured to the wall with stainless steel brackets.

I. Urinal-Screen Construction:

1. Flat-Panel Urinal-Screen: Matching panel construction
2. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum 1-1/4 inches (32 mm) thick.

J. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 4 inches (76 mm) high, finished to match hardware.

K. Brackets (Fittings):
1. Full-Height (continuous) Type: Manufacturer's standard design; stainless steel.

L. Baked Enamel Color: Manufacturer's standard finishes.

1. Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Stainless steel.
2. Hinges: Manufacturer's standard.

3. Latch and Keeper: Manufacturer's standard aluminum surface mounted side latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Continuous heavy duty stainless steel wall brackets are predrilled. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Overhead Braced Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage. Top of pilasters to be securely braced with extruded aluminum headrail with integral crown loafer rail.

B. Door Size and Swings: Unless otherwise indicated, provide 26-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

C. Urinal Screen Size: Provide 24-inch wide screen, with posts extending from floor to top of screen and sized to provide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Between Pilasters and Panels: 1/2 inch (13 mm).
b. Panels and Walls: 1 inch (25 mm).

B. Overhead Braced Units: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Secure pilasters braced with extruded aluminum head rail with integral crown loafer rail.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

D. No evidence of cutting, drilling and/or patching shall be visible on the finished work.

E. Finished surfaces shall be cleaned after installation and be left free of all imperfections.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 2113

SECTION 102113.13 - METAL TOILET COMPARTMENTS

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 painted steel toilet compartments configured as toilet enclosures urinal screens.

1.3 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 toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
4. Show locations of centerlines of toilet fixtures.
5. Show locations of floor drains.
6. Show **ceiling grid, ceiling-mounted items, and** overhead support or bracing locations.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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** for toilet compartments designated as accessible.

2.2 PAINTED STEEL TOILET COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. Accurate Partitions Corporation.
2. All American Metal Corp.
3. American Sanitary Partition Corporation.
4. Ampco, Inc.
5. Bradley Corporation; Mills Partitions.
6. Global Steel Products Corp.
7. Knickerbocker Partition Corporation.
8. Marlite.

C. Toilet-Enclosure Style: Floor anchored .

D. Urinal-Screen Style: Wall hung, flat panel.

E. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least 250 lbf (1112 N), when tested according to ASTM F 446, without deformation of panel.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

F. Urinal-Screen Construction:

1. Flat-Panel Urinal Screen: Matching panel construction.

G. Facing Sheets and Closures: Electrolytically coated steel sheet with nominal base-metal (uncoated) thicknesses as follows:

1. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.048 inch.
2. Panels: Manufacturer's standard thickness, but not less than 0.030 inch.
3. Doors: Manufacturer's standard thickness, but not less than 0.030 inch.
4. Flat-Panel Urinal Screens: Thickness matching the panels.

H. Urinal-Screen Post: Manufacturer's standard post design of **material matching the thickness and construction of pilasters or** 1-3/4-inch- **square, aluminum tube with satin finish** with shoe matching that on the pilaster.

I. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.

1. Material: Chrome-plated zamac.
2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position , allowing emergency access by lifting door.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors **and entrance-screen doors**.

2.4 MATERIALS

A. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.

1. Electrolytically Zinc Coated: ASTM A 879/A 879M, 01Z.

B. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

C. Stainless-Steel Castings: ASTM A 743/A 743M.

D. Zamac: ASTM B 86, commercial zinc-alloy die castings, chrome plated.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories, and solid blocking within panel where required for attachment of toilet accessories.

B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at bottoms of posts. Provide shoes at posts to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Coordinate layout and installation of supports, inserts, and anchors built into other units of work for toilet compartment anchorage.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position indicated with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors **and doors in entrance screens** to return doors to fully closed position.

END OF SECTION 102113.13

SECTION 10 2213 - WIRE MESH PARTITIONS

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. Standard-duty wire mesh partitions.

B. Related Sections:

1. Division 08 Section “Door Hardware” for lock cylinders for wire mesh partition doors.
2. Division 32 Section "Chain Link Fences and Gates" for chain-link fencing.

1.3 DEFINITIONS

A. As defined in ASTM E 2016:

1. Intermediate Crimp: Wires pass over one and under the next adjacent wire in both directions, with wires crimped before weaving and with extra crimps between the intersections.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wire mesh items.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Setting Drawings: For anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Welding certificates.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wire mesh unit hardware to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Installer's responsibilities include fabricating and installing wire mesh items and providing professional engineering services needed to assume engineering responsibility.

B. Source Limitations: Obtain wire mesh items from single source from single manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire mesh items with cardboard protectors on perimeters of panels and doors and with posts wrapped to provide protection during transit and Project-site storage. Use vented plastic.

B. Inventory wire mesh partition door hardware on receipt and provide secure lockup for wire mesh partition door hardware delivered to Project site.

1. Tag each item or package separately with identification and include basic installation instructions with each item or package.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acorn Wire & Iron Works, Inc.
2. California Wire Products Corporation.
3. G-S Company (The).
4. Indiana Wire Products, Inc.
5. Jesco Industries, Inc.
6. King Wire Partitions, Inc.
7. Miller Wire Works, Inc.
8. Newark Wire Works Inc.
9. Standard Wire & Steel Works.
10. Wire Crafters, LLC.

2.2 MATERIALS

A. Steel Wire: ASTM A 510M (ASTM A 510).

B. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.

C. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

D. Steel Pipe: ASTM A 53/A 53M, Schedule 40 unless another weight is indicated or required by structural loads.

E. Square Steel Tubing: ASTM A 500, cold-formed structural-steel tubing.

F. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with Z180 (G60) zinc (galvanized) or ZF180 (A60) zinc-iron-alloy (galvannealed) coating designation.

G. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.

H. Postinstalled Expansion Anchors: With capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Carbon Steel: Zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition (mild).
2. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four the loads imposed.
3. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.3 STANDARD-DUTY WIRE MESH PARTITIONS

A. Mesh: 3.5-mm- (0.135-inch-) diameter, intermediate-crimp steel wire woven into 38-mm (1-1/2-inch) diamond mesh.

B. Vertical Panel Framing: 32-by-16-by-2.5-mm (1-1/4-by-5/8-by-0.097-inch) cold-rolled, C-shaped steel channels with 6-mm- (1/4-inch-) diameter bolt holes spaced not more than 450 mm (18 inches) o.c. along center of framing.

C. Horizontal Panel Framing: 25-by-13-by-3-mm (1-by-1/2-by-1/8-inch) cold-rolled steel channels.

D. Horizontal Panel Stiffeners: 2 cold-rolled steel channels, not less than 25 by 9.5 by 3 mm (1 by 3/8 by 1/8 inch), bolted or riveted toe to toe through mesh or 25-by-13-by-3-mm (1-by-1/2-by-1/8-inch) cold-rolled steel channels with wire woven through.

E. Top Capping Bars: 57-by-25-mm (2-1/4-by-1-inch) cold-rolled steel channels.

F. Posts for 90-Degree Corners: 32-by-32-by-3-mm (1-1/4-by-1-1/4-by-1/8-inch) steel angles with 6-mm- (1/4-inch-) diameter bolt holes aligning with bolt holes in vertical framing; with floor anchor clips.

G. Posts for Other-Than-90-Degree Corners: Manufacturer's standard steel pipe or tubing with 6-mm- (1/4-inch-) diameter bolt holes aligning with bolt holes in vertical framing.

1. Partitions up to 3.7 m (12 Feet) High: 32-mm (1-1/4-inch) OD.
2. Partitions up to 6.1 m (20 Feet) High: 65-mm (2-1/2-inch) OD.

H. Line Posts: 76-mm-by-1.9-kg (3-inch-by-4.1-lb) or 89-by-32-by-3.2-mm (3-1/2-by-1-1/4-by-0.127-inch) steel channels; with 125-by-450-by-6-mm (5-by-18-by-1/4-inch) steel base plates punched for attachment to floor.

I. Three- and Four-Way Intersection Posts: 32-by-32-mm (1-1/4-by-1-1/4-inch) tubular steel, with 6-mm- (1/4-inch-) diameter bolt holes aligned for bolting to adjacent panels.

J. Floor Shoes: Steel, cast iron, or cast aluminum, not less than 50 mm (2 inches) high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.

K. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from 32-by-13-by-3-mm (1-1/4-by-1/2-by-1/8-inch) steel channels or C-channels, banded with 32-by-3-mm (1-1/4-by-1/8-inch) flat steel bar cover plates on 3 sides, and with 3-mm- (1/8-inch-) thick angle strike bar and cover on strike jamb.

1. Hinges: Full-surface type, 76-by-76-mm (3-by-3-inch) steel, 1-1/2 pairs per door; bolted, riveted, or welded to door and jamb framing.
2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
3. Cylinder Lock: Mortise type with cylinder specified in Division 08 Section "Door Hardware"; operated by key outside and lever inside.
4. Inactive Leaf Hardware: Cane bolt at bottom and chain bolt at top.

L. Accessories:

1. Wall Clips: Manufacturer's standard, cold-rolled steel sheet[; allowing up to 25 mm (1 inch) of adjustment].

M. Finish for Uncoated Ferrous Steel: Hot-dip galvanized unless otherwise indicated.

2.4 FABRICATION

A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. As required for complete installation, provide bolts, hardware, and accessories with manufacturer's standard finishes.

1. Fabricate wire mesh items to be readily disassembled.
2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.

B. Standard-Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.

1. Mesh: Securely clinch mesh to framing.
2. Framing: Fabricate framing with mortise and tenon corner construction.

a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
b. Fabricate three- and four-way intersections using intersection posts.
c. Fabricate partition and door framing with slotted holes for connecting adjacent panels.

3. Fabricate wire mesh partitions with 76 mm (3 inches) of clear space between finished floor and bottom horizontal framing, between top framing members and overhead structure and between framing members and penetrations.
4. Doors: Align bottom of door with bottom of adjacent panels.

a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.

5. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.6 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron components.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine floors for suitable conditions where wire mesh items will be installed.

C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRE MESH PARTITIONS ERECTION

A. Anchor wire mesh partitions to floor with 9.5-mm- (3/8-inch-) diameter, postinstalled expansion anchors at 305 mm (12 inches) o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.

1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.

B. Anchor wire mesh partitions to walls at 305 mm (12 inches) o.c. through back corner panel framing and as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.

C. Secure top capping bars to top framing channels with 6-mm- (1/4-inch-) diameter "U" bolts spaced not more than 700 mm (28 inches) o.c.

D. Provide line posts at locations indicated or, if not indicated, as follows:

1. On each side of sliding door openings.
2. For partitions that are 2.1 to 2.7 m (7 to 9 feet) high, spaced at 4.6 to 6.1 m (15 to 20 feet) o.c.
3. For partitions that are 3.0 to 3.7 m (10 to 12 feet) high, located between every other panel.
4. For partitions that are more than 3.7 m (12 feet) high, located between each panel.

E. Install doors complete with door hardware.

F. Bolt accessories to wire mesh partition framing.

G. At unheated storage building – use of structural steel bent is allowable for lateral support of wire mesh partition. Allow for deflection as specified in 133419.

3.3 ADJUSTING AND CLEANING

A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Remove and replace defective work including doors and framing that are warped, bowed, or otherwise unacceptable.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 10 2213

SECTION 10 2600 - WALL AND DOOR PROTECTION

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. Corner guards (for all gypsum board wall outside corners).

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for metal angle corner guards.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 01 Section "Quality Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).

a. Store corner-guard covers in a vertical position.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Deterioration of plastic and other materials beyond normal use.

2. Warranty Period: Five years from date of Final Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M.

B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.2 CORNER GUARDS

A. Manufacturers: Subject to compliance with requirements, provide, or comparable product by one of the following:

1. IPC Door and Wall Protection Systems; Division of InPro Corporation. (Basis of Design)

2. Construction Specialties, Inc.
3. Korogard Wall Protection Systems; a division of RJF International Corporation.

B. Product No,: 183124H-304

1. Material: Stainless steel, Type 304.

a. Thickness: Minimum 0.0625 inch (1.6 mm)
b. Finish: Directional satin, No. 4.

2. Wing Size: Nominal 3-1/2 by 3-1/2 inches (90 by 90 mm).
3. Corner Radius: 1/8 inch (3 mm).
4. Mounting: Countersunk screws through factory-drilled mounting holes.

2.3 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.4 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Remove tool and die marks and stretch lines, or blend into finish.
2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
3. Run grain of directional finishes with long dimension of each piece.
4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings or, if not indicated, at heights indicated below:

a. Install 4” above finished floor @ top of wall base.

2. Screw on: Position the corner guard on the wall and attach it using the supplied screws.
3. Remove the protective plastic covering from the exposed surface of the corner guard.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

END OF SECTION 10 2600

SECTION 10 2800 - TOILET, BATH, AND LAUNDRY 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. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Mirrors

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, unless otherwise noted:

1. American Specialties, Inc
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.
4. Georgia-Pacific

B. Toilet Tissue (Jumbo-Roll) Dispenser:

1. Owner provided, contractor installed.

C. Paper Towel Dispenser:

1. Owner provided, contractor installed.

D. Liquid-Soap Dispenser:

1. Owner provided, contractor installed.

a. One per lavatory or sink installed in contract

E. ADA Toilet Stall Grab Bar :

1. Bobrick B6806 series; (Basis of Design)
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 18 guage (1.2 mm) thick.

a. Finish: Smooth, No. 4 finish (satin).

4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings.

F. ADA 2-wall Shower Grab Bar :

1. Bobrick B6861 series; (Basis of Design)
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 18 guage (3mm) thick.

a. Finish: Smooth, No. 4 finish (satin).

4. Outside Diameter: 3-1/4 inch
5. Configuration and Length: As indicated on Drawings.

G. Sanitary-Napkin Disposal Unit :

1. Owner provided, contractor installed.

H. Mirror Unit:

1. Bobrick B-2908 series; (Basis of Design).
2. Frame: Stainless-steel channel.

a. Corners: Welded and ground smooth.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

4. Sizes: 18” x 36” (610 x 910mm).

I. Air Fresheners / Deodorizers:

1. Manufacturers: Technical Concepts, Model 401218 with no substitutions accepted.
2. Mounting: Surface mounted at 7'-0" A.F.F.
3. Provide (1) per restroom.

J. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.

K. Shower Curtain Rod:

1. Bobrick B-6047 series, (Basis of Design).
2. Description: 1-1/4-inch (32-mm) OD; fabricated from nominal 0.05-inch- (1.3-mm-) thick stainless steel.
3. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
4. Finish: No. 4 (satin).

L. Shower Curtain:
1. Bobrick 204-2 Shower Curtaint, (Basis of Design).
2. Material: Opaque, matte white vinyl, .008" thick with antimicrobial and flame retardants.
3. Mounting Mechanism: Provide 7 hooks for installation on curtain rod.
4. Dimensions: 42" W x72" H

M. Shower Seat :

1. Bobrick B-5181 Surface Mounted Shower Seat, (Basis of Design).
2. Configuration: Left or right hand field installation. (Reference location for hand.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
5. Dimensions: as shown on drawings.

N. Robe Hook /Towel Pin:

1. Bobrick B-6777 Surface Mounted, (Basis of Design).
2. Finish: Satin-finish Stainless Steel.
3. Provide (1) per shower.

2.3 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

1. Reference MEP specifications

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 2800

SECTION 10 4413 - FIRE EXTINGUISHER CABINETS

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. Owner-provided portable fire extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For each type of fire protection cabinet indicated.

1.4 CLOSEOUT SUBMITTALS

A. 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 indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209 (ASTM B 209M).
2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

D. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 6 mm thick, with Finish 1 (smooth or polished).

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Larsen's Manufacturing Company; 2409-6R; (Basis of Design).
b. J. L. Industries, Inc., a division of Activar Construction Products Group.
c. Watrous Division, American Specialties, Inc.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

1. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.

E. Cabinet Trim Material: Aluminum sheet or extruded-aluminum shapes.

F. Door Material: Aluminum sheet.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Acrylic sheet.

1. Acrylic Sheet Color: Clear transparent acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:

1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.

a. Identify fire extinguisher in fire protection cabinet with the words “FIRE EXTINGUISHER".

1) Location: Applied to cabinet door.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: Red.
4) Orientation: Vertical.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

a. Exterior of cabinet, door, and trim except for those surfaces indicated to receive another finish.
b. Interior of cabinet.

2. Aluminum: Clear anodic.
3. Steel: Baked enamel or powder coat.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling".

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed 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 indicated below:

1. Fire Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide semi-recessed 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.

C. Identification: Apply vinyl lettering at locations indicated.

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 10 4413

SECTION 104416 - FIRE 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 portable, hand-carried fire extinguishers.

B. Owner-Furnished Material: fire extinguishers.

C. Related Sections:

1. Division 10 Section "Fire Extinguisher Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each indicated.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

    a. Badger Fire Protection; a Kidde company.
    b. J. L. Industries, Inc.; a division of Activar Construction Products Group.
    c. Larsen's Manufacturing Company.
    ?. Potter Roemer LLC.

3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Regular Dry-Chemical Type : UL-rated 10 lb. nominal capacity, with sodium bicarbonate-based dry chemical in manufacturer's standard enameled container.

C. Purple-K Dry-Chemical Type in Aluminum Container: UL-rated 30-B:C, 5-lb2.3-kgnominal capacity, with potassium bicarbonate-based dry chemical in enameled-aluminum container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

SECTION 10 5113 - METAL LOCKERS

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. Heavy-duty metal lockers.
   2. Metal Personnel Lockers
   3. Locker benches

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locker trim and accessories.
   2. Include locker identification system and numbering sequence.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Maintenance Data: for adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Regulatory Requirements: Where metal lockers are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

B. Deliver master and control keys and combination control charts to Owner by registered mail or overnight package service.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify the following by field measurements before fabrication and indicate measurements on Shop Drawings:
   1. Concealed framing, blocking, and reinforcements that support metal lockers before they are enclosed.
   2. Recessed openings.
   3. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed opening dimensions and proceed with fabricating metal lockers without field measurements. Coordinate wall and floor construction to ensure that actual recessed opening dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Faulty operation of latches and other door hardware.
   2. Damage from deliberate destruction and vandalism is excluded.
   3. Warranty Period for All-Welded Metal Lockers: Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL LOCKERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide Athletic Lockers; by List Industries, Inc or comparable product by one of the following:
   1. DeBourgh Mfg. Co.
   2. Art Metal Products
   3. Lyon Worspace Products, LLC.

B. Locker Types: Reference drawings for dimension per unit
   1. Single Tier (Provide 1 ADA compliant locker)

C. Locker Construction
   1. Lockers to be welded at seams and joints with exposed welds sanded smooth.
   2. No bolts, screws or rivets to be used in assembly of locker units.

3. Ship lockers set-up, ready to be anchored in place in accordance with manufacturer's instructions.

D. Body of Lockers
1. Sides and Intermediate Partitions: Constructed of 1-inch by 1-inch by 1/8-inch steel angle iron frame with ¾ inch, 16 gauge, bond sheared, flattened expanded metal welded to steel angle frames. Formed sheet steel locker frames are not acceptable.
2. Exposed End Panels: Constructed of 1 inch by 1 inch by 1/8 inch steel angle iron frame with 16 gauge sheet steel welded to steel angle frame.
3. Backs: Solid sheet of 18 gauge cold rolled sheet steel welded to frames of sides and intermediate partitions.
4. Shelves and Tier Dividers: Constructed of 18 gauge cold rolled sheet steel welded to side and intermediate partition construction. Shelves provided in lockers 60-inches and taller, located to provide a minimum of 12 inches clearance.

E. Doors
1. Doors are 16 gauge steel, formed outer panel with double bends on both sides and a single bend on top and bottom with 18 gauge steel formed stiffener panel.
2. Door stiffener runs top to bottom on hinge side of door and is securely welded to outer door to form a reinforced channel for additional torque-free strength and sound reduction when closing door. (Inner panel not available on 9 inch wide or box lockers 12 inches high or less).

F. Door Ventilation:

1. -Louvered doors with six louvers at the top and bottom of the formed door providing 7% ventilation per square inch.

G. Latching
1. Door containing stainless steel cup recessed into formed door (doors 18 inches and higher).
2. 12 gauge steel finger lift mechanism.
3. Spring activated nylon slide latch enclosed in steel latch channel allows closing of door while padlock or built-in lock is in position.
4. Rubber bumpers riveted to door stops for silent operation.
5. Special needs latch (ADA)
6. Latching operation with a three-point/three-sided cremone latch (like the Sentry I) has an extended six inch handle creating a weighted counterbalance allowing activation by either upward or downward motion.

H. Locks
1. Pad locks

I. Hinges:
1. Hinges to be 3 inch, five knuckle, 14 gauge heavy-duty fast pin welded to both door and frame.
2. Locker doors 42 inches high or less shall have 2 hinges.
3. Doors over 42 inches shall have 3 hinges.

J. Reinforced Bottom:

1. Provide 16 gauge spacer channel welded to locker bottom from front to back for a more secure installation to wood curb.

K. J. Filler Panels: Manufacturer's standard fabricated from 18 gauge solid steel finished to match lockers. Provide slip joint fillers angle formed to receive filler panel.

L. Finish:
1. Complete locker unit to be thoroughly cleaned, phosphatized and sealed.
2. Finish to be baked pure TGIC polyester powder coat with a minimum 2-3 mil thickness.
3. Color of lockers shall be chosen from manufacturer's 47 standard colors.

M. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:

N. Accessories:
1. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
2. Closures: Vertical or Hipped-end type.
3. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
4. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
5. Boxed end panels in subparagraph below conceal all fasteners and holes and are in addition to standard ends that permit fasteners and unused holes to be exposed. See Evaluations.
6. Boxed End Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.

2.2 METAL PERSONNEL LOCKERS

A. Basis-of-Design Product: No substitutions accepted:
1. All-Welded Single Tier Bulk Storage Metal Lockers.
a. Freestyle Personal Storage Locker (Match existing)
b. Southwest Storage Group 1-800-803-1083 (Aaron Reynolds)

B. Dimensions: 84"H x24"Wx24"D- Sloped top storage shelf with hanger bar weapon support for 9MM and long gun intermediate shelf with rubber mat locking storage drawer 9" H bench with louvered storage drawer and boot tray.

C. Finish: powder coat
1. Color(s): As selected by Architect from manufacturer's full range

2.3 ADA LOCKER BENCHES

A. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
1. Size: 20" W x 42" Long x 17.5" High
2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

B. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
1. Tubular Steel: 1-1/2-inch- (38-mm-) diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.
a. Color: Architect to select from standard powder coat paint colors.

2.4 FABRICATION

A. Fabricate metal lockers square, rigid, and without warp and with perforated metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
   1. Form body panels, doors, shelves, and accessories from one-piece of sheet metal unless otherwise indicated.
   2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. All-Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

D. Identification Plates: Manufacturer's standard, etched, embossed, or stamped plates, with numbers and letters at least 3/8 inch (9 mm) high.

E. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

F. Accessible Lockers: Fabricate as follows:
   1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
   2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.

G. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

H. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

I. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
   1. Provide one-piece panels for double-row (back-to-back) locker ends.

J. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
   1. Provide one-piece panels for double-row (back-to-back) locker ends.

PART 3 - EXECUTION

3.1 STEEL SHEET FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.

C. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.

D. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

3.2 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.
   1. Vertical dividers and door frames shall be securely anchored to wall and/or floor with an anchoring system selected by the installer.
   2. All door frames, tops and backs fasten together with 1/4” x 3/4” cadmium plated bolts and nuts, to be provided by installer.
   3. Anchor back-to-back metal lockers to base.

B. All-Welded Metal Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
   1. Attach hooks with at least two fasteners.
   2. Attach door locks on doors using security-type fasteners.
   3. Attach filler panels with concealed fasteners. Locate fillers panels where indicated on Drawings.
   4. Attach sloping top units to metal lockers, with closures at exposed ends.
   5. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
   6. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 5113

SECTION 10 7500 - FLAGPOLES

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 ground-mounted flagpoles made from aluminum.

B. Owner-Furnished Material: Flags.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:

1. Wind Loads: 90 mph (40 m/s) according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."
2. Base flagpole design on polyester and nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.

1. Include section, and details of foundation system for ground-mounted flagpoles.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Flagpole; a Kearney-National Inc. company.
2. Atlantic Fiberglass Products, Inc.
3. Baartol Company.
4. Concord Industries, Inc.
5. Eder Flag Manufacturing Company, Inc.
6. Ewing Flagpoles.
7. Lingo Inc.; Acme Flagpole Company Division.
8. Millerbernd Manufacturing Company.
9. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
10. PLP Composite Technologies, Inc.
11. Pole-Tech Company Inc.
12. U.S. Flag & Flagpole Supply, LP.
13. USS Manufacturing Inc.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
3. Provide self-aligning, snug-fitting joints.

B. Exposed Height: One each at 25 feet (7.5 m) and 30 feet (9.25 m).

C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- (1.6-mm-) nominal wall thickness. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

1. Provide flashing collar of same material and finish as flagpole.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch (1.6-mm) spun aluminum, finished to match flagpole.

B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- (8-mm-) diameter, braided polypropylene halyard and 9-inch (228-mm) cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

1. Provide one halyard and one cleat at each flagpole.
2. Provide cast-metal cleat covers, finished to match flagpole, secured with cylinder locks.
3. Provide halyard covers consisting of a 2-inch (50-mm) channel, 60 inches (1500 mm) long, finished to match flagpole.
4. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

a. Provide with neoprene or vinyl covers.

2.4 MISCELLANEOUS MATERIALS

A. Sand: ASTM C 33, fine aggregate.

B. Elastomeric Joint Sealant: Joint sealant complying with requirements in Division 07 Section "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, for Use O.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Place concrete, as specified in Division 03 Section "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.3 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure. Install flagpole, plumb, in foundation tube.

1. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 10 7500

SECTION 12 2413 – ROLLER WINDOW SHADES

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

B. Section Includes:
   1. Manually operated sunscreen roller shades.
   2. Electrically operated double-roller sunscreen and room-darkening shades.

C.

1.2 RELATED SECTIONS

A. Section 09 2900 - Gypsum Board: Coordination with gypsum board assemblies.
B. Division 16 - Electrical: Electric service for motor controls.

1.3 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
B. NFPA 70 - National Electrical Code.
C. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.4 ACTION SUBMITTALS

A. Submit Environmental Certification and Third Party Evaluation per Section 1.5 Qualifications.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.
   5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.

D. Roller Window Shade Schedule: For all roller window shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of ten years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.

E. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

F. Third Party Evaluation: Provide documentation stating the shade cloth has undergone third party evaluation for all chemical inputs, down to a scale of 100 parts per million, that have been evaluated for human and environmental safety. Identify any and all inputs, which are known to be carcinogenic, mutagenic, teratogenic, reproductively toxic, or endocrine disrupting. Also identify items that are toxic to aquatic systems, contain heavy metals, or organohalogens. The material shall contain no inputs that are known problems to human or environmental health per the above major criteria, except for an input that is required to meet local fire codes.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY

A. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide, or comparable products by one of the following:
1. Draper Inc.
2. Hunter Douglas Contract.
3. Lutron Electronics Co., Inc.
4. MechoShade; (Basis of Design).
5. Shade Techniques, LLC

B. Source Limitations: Obtain roller window shades from single source from single manufacturer.

2.2 APPLICATIONS/SCOPE

A. Products: MechoShade Roller Window Shades
B. Roller Window Shade Schedule:
1. **Shade Type 1**: Motorized blackout roller shades, Electro Shade single bracket with fascia, wall mounted to window frame, 6000 Series Fabric (railroaded), in clerestory windows where noted on drawings. Shades to break on vertical mullions. Horizontal battens to be located at horizontal mullions.
2. **Shade Type 2**: Motorized “double”, solar and room darkening blackout roller shades, operating independently of each other, using Electro Shade #15 Double Shade Bracket with fascia, at exterior windows where noted on drawings. Shades to be multi-banded and break at vertical mullion.
3. **Shade Type 3**: Motorized solar roller shades, using Electro Shade single Bracket with fascia, Wall Mounted to window frame, at exterior windows where noted on drawings. Shades to be multi-banded and break at vertical mullion.
4. **Shade Type 4**: Manual operating interior solar roller shades, Mecho 5 WI Bracket with fascia, wall mounted to window frame, 6000 Series Fabric (railroaded), at exterior windows where noted. Shades to break on vertical mullions. Horizontal battens to be located where required at horizontal mullions.

2.3 SHADE CLOTHS

A. Visually Transparent Single-Fabric Shadecloth: EuroTwill "6000" Series: 0.010 diameter (0.254 mm) non-raveling vinyl/polyester yarn, fabric thickness 0.025 inches (0.635 mm). Fabric Comes in 96” Goods.
1. Extra Dense Twill Weave "6000" series, 2-3 percent open. - RAILROADED
2. Color: Selected from manufacturer's standard colors.

B. Vinyl Room Darkening Shadecloth (Single-Fabric): "0700 series", blackout material, washable and colorfast laminated and embossed vinyl coated fabric, 0.012 inches thick (0.30 mm) blackout material and weighing 0.81 lbs. per square yard, with a minimum of 62 threads per square inch in colors selected from manufacturer's available range.- Fabric Comes in 72" Goods.
   1. Color: Selected from manufacturer's standard colors. – NON- RAILROADED

2.4 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
   1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
   2. Shade band and Shade Roller Attachment:
      a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.
      b. Provide for positive mechanical engagement with drive / brake mechanism.
      c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
      d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
      e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.5 SHADE FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

B.

C. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:
   1. Bottom hem weights.

D. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

E. Battens shall be concealed in a integrally-colored fabric to match the inside and outside colors of the shadeband, in accordance with manufacturer's published standards for spacing and requirements.
   1. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.
   2. Batten pockets shall be self-colored fabric front and back RF welded into the shadecloth. A self-color opaque liner shall be provided front and back to eliminate any see through of the batten pocket that shall not exceed 1-1/2 inches (38.1 mm) high and be totally opaque. A see-through moiré effect, which occurs with multiple layers of transparent fabrics, shall not be acceptable.

2.6 COMPONENTS

A. Access and Material Requirements:
   1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
   2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
   3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Motorized Shade Hardware and Shade Brackets:
   1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
   2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
   3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor (multi-banded shade, subject to manufacturer’s design criteria).

C. Manual Operated Chain Drive Hardware and Brackets:
   1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
   2. Provide hardware capable for installation of a removable fascia, regular roll, which shall be installed without exposed fastening devices of any kind.
   3. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer’s design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
   4. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
   5. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
   6. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.

7. Drive Bracket / Brake Assembly:
   a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
   b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
   c. The brake shall be an over -running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
   d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
   e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

D. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.7 SHADE MOTOR DRIVE SYSTEM

A. Shade Motors:
   1. Tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor operating at 110v AC (60hz), single phase, temperature Class A, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor.
   2. Conceal motors inside shade roller tube.
   3. Maximum current draw for each shade motor of 2.3 amps.
   4. Use motors rated at the same nominal speed for all shades in the same room.

B. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly.

2.8 ACCESSORIES

A. Fascia (for Shade Types 1, 2, 3 AND 4):
   1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
   2. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
   3. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
   4. Notching of Fascia for manual chain shall <u>not</u> be acceptable.

B. Room Darkening Side and / or Sill Channels
   1. Extruded aluminum with polybond edge seals and SnapLoc-mounting brackets and with concealed fastening. Exposed fasting is not acceptable. Channels shall accept one-piece exposed blackout hembar with vinyl seal to assure side light control and sill light control.

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. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Single-Source Responsibility for Motorized Interior Roller Shades: Design, engineering, and installation of motorized roller shade systems, motors, shall be provided by a single manufacturer and their authorized installer/dealer. The manufacturer and their authorized installer/dealer shall produce electrical drawings for the installation of control wiring for the motors, or motor controllers of the motorized roller shades. Power wiring (line voltage), shall be provided by the Contractor, in accordance with the requirements provided by the manufacturer. Coordinate the following with the roller shade installer/dealer:
   1. Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer’s requirements, as indicated on the mechanical and electrical drawings.
   2. Contractor shall coordinate with requirements of roller shade installer/dealer, before inaccessible areas are constructed.
   3. Contractor shall provide and run all line voltage as dedicated home runs, terminating in junction boxes, from the roller shade motors to switch locations shown in the drawings. All above-ceiling and concealed wiring shall be plenum-rated, or installed in conduit, as required by the electrical code having jurisdiction. Fully recess conduit, control panels and junction boxes within framed and masonry walls wherever possible.
   4. Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location or schedule.

C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

D. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

E. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Final Completion.

END OF SECTION 12 2413

SECTION 142400 - HYDRAULIC ELEVATORS

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 hydraulic passenger and elevators.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Section 051200 "Structural Steel Framing" for the following:
    a. Attachment plates, angle brackets, and other structural-steel preparations for fastening guide-rail brackets.
    b. Structural-steel shapes for subsills that are part of steel frame.
3. Section 055000 "Metal Fabrications" for the following:
    a. Pit ladders.
4. Section 096813 Tile Carpeting> for finish flooring in elevator cars.
5. Section 221429 "Sump Pumps" for sump pumps, sumps, and sump covers in elevator pits.
6. Section 271500 "Communications Horizontal Cabling" for telephone service for elevators **and for Internet connection to elevator controllers for remote monitoring of elevator performance if required**].
7. [**Section 283111 "Digital, Addressable Fire-Alarm System"**] [**Section 283112 "Zoned (DC Loop) Fire-Alarm System"**] for smoke detectors in elevator lobbies to initiate emergency recall operation **and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation** and for connection to elevator controllers.
8. Section 312000 "Earth Moving" for excavating well hole to accommodate cylinder assembly and for the disposition of excavated material from the cylinder well hole.

1.3 ALLOWANCES

A. Elevator Car Allowances: Provide finished passenger elevator cars under the Elevator Car Allowance specified in Section 012100 "Allowances." Allowance includes furnishing and installing the following:

1. Car wall finishes, including trim.
2. Car floor finishes.
3. Car ceiling finishes.
4. Car door finishes.
5. Hoistway door and frame finishes.
6. Car light fixtures.
7. Handrails.
8. Cutouts and other provisions for installing elevator signal equipment in cars.

1.4 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

B. Service Elevator: A passenger elevator that is also used to carry freight.

1.5 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures; hoistway entrances; and operation, control, and signal systems.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing; machine room layout; coordination with building structure; relationships with other construction; and locations of equipment.
2. Include large-scale layout of car-control station and standby-power operation control panel.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support as well as maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes, 3-inch- square Samples of sheet materials and 4-inch lengths of running trim members.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Manufacturer Certificates: Signed by elevator manufacturer, certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service including standby-power generator, as shown and specified, are adequate for elevator system being provided.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Submit manufacturer's/installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44 including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

D. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.10 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Furnish well casing and coordinate delivery with related excavation work.

C. Coordinate locations and dimensions of other work specified in other Sections that relates to hydraulic elevators, including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.11 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty Period: <1> year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide MEI, Twin Jack Holeless Passenger Elevator or comparable product by one of the following:

1. Minnesota Elevator, Inc.
2. Otis Elevator Co.
3. Schindler Elevator Corp.
4. ThyssenKrupp Elevator.

B. Source Limitations: Obtain elevators from single manufacturer.

1. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
2. Project Seismic Design Category: A
3. Elevator Component Importance Factor: 1.0.
4. Design earthquake spectral response acceleration short period (Sds) for Project is 0.127.
5. Provide earthquake equipment required by ASME A17.1/CSA B44.
6. Provide seismic switch required by ASCE/SEI 7.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturers' standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:
1. Elevator Number: Elevator 216Type: Holeless, dual cylinder.
2. Rated Load: 2500 lb .
3. Rated Speed: 150 fpm.
4. Operation System: Single automatic operation.
5. Auxiliary Operations:

a. Standby-power operation.
b. Standby-powered lowering.
c. Automatic dispatching of loaded car.
d. Nuisance call cancel.
e. Loaded-car bypass.
f. Off-peak operation
g. Automatic operation of lights and ventilation fans.

6. Security Features: Card-reader operation.
7. Car Enclosures:

a. Inside Width: 84 inches from side wall to side wall.
b. Inside Depth: 61 inches from back wall to front wall (return panels).
c. Inside Height: Not less than 93 inches to underside of ceiling.
d. Front Walls (Return Panels): stainless steel, No. 4 finish with integral car door frames.
e. Car Fixtures: Satin stainless steel, No. 4 finish.
f. Side and Rear Wall Panels: Removable Raised Plastic laminate Panels.
g. Reveals: powder-coated steel.

h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
i. Door Sills: Aluminum.
j. Ceiling: Drop Downlite Laminated.
k. Handrails: 1/2 by 1 1/2 inches rectangular, at 3 sides of car.
l. Floor prepared to receive carpet (specified in Section 096813 "Tile Carpeting").

8. Hoistway Entrances:

a. Width: 42 inches .
b. Height: [86 inches] <Insert dimension>.
c. Type: Single-speed side sliding.
d. Frames at First Floor Satin stainless steel, No. 4 finish.
e. Frames at Other Floors: Satin stainless steel, No. 4 finish.
f. Doors and Transoms: Satin stainless steel, No. 4 finish.
g. Doors and Transoms at Other Floors: Satin stainless steel, No. 4 finish.
h. Sills at First Floor: Aluminum.
i. Sills at Other Floors: Aluminum.

9. Hall Fixtures at First Floor: Satin stainless steel, No. 4 finish.
10. Hall Fixtures at Other Floors: Satin stainless steel, No. 4 finish.
11. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
b. Provide hooks for protective pads in [service car] [all cars] and [one] [two] <Insert number> complete set(s) of full-height protective pads.

2.4 SYSTEMS AND COMPONENTS

A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.

1. Pump shall be [**submersible type with submersible squirrel-cage induction motor, and shall be suspended inside oil tank from vibration isolation mounts**] [**or**] [**shall be tank-top-mounted type with fan-cooled, squirrel-cage induction motor, and shall be mounted on oil tank with vibration isolation mounts and enclosed in prime-painted steel enclosure lined with** 1-inch- **thick, glass-fiber insulation board**].
2. Motor shall have [**wye-delta**] [**or**] [**solid-state**] starting.
3. Motor shall have variable-voltage, variable-frequency control.

B. Hydraulic Silencers: System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.

C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.

1. Cylinder units shall be connected with dielectric couplings.

D. Hydraulic Fluid: Elevator manufacturer's standard fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.

E. Guides: Roller guides. Provide guides at top and bottom of car frame.

2.5 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.

B. Auxiliary Operations:

1. Single-Car Standby-Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at main lobby. Manual operation causes automatic operation to cease.

C. Security Features: Security features shall not affect emergency firefighters' service.

1. Card-Reader Operation: System uses card readers at hall push-button stations to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. Provide stripe-swipe card reader integral with each car-control station.

a. Security access system equipment is specified in Section 281300 "Access Control."

2. Car-to-Lobby Feature: Feature, activated by keyswitch at main lobby, that causes car to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, calls registered before keyswitch activation are completed and normal operation is resumed.

2.6 DOOR-REOPENING DEVICES

A. Infrared Array: Provide door-reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

2.7 CAR ENCLOSURES

A. General: Provide wall panels, with removable car roof, access doors, power door operators, and ventilation.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor: Exterior, C-C Plugged grade plywood, not less than 7/8-inch nominal thickness.
2. Stainless-Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless-steel sheet.
3. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch fire-retardant-treated particleboard with plastic-laminate panel backing and manufacturer's standard protective edge trim. Panels have a flame-spread index of 75 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Architect from plastic-laminate manufacturer's full range.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
9. Plastic-Laminate Ceiling: Flush panels, with four low-voltage downlights (LED) in each panel. Align ceiling panel joints with joints between wall panels.
10. Light Fixture Efficiency: Not less than 35 lumens/W.
11. Ventilation Fan Efficiency: Not less than 3.0 cfm/W .

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

B. Fire-Rated Hoistway Entrance Assemblies: Door-and-frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to [NFPA 252] [or] [UL 10B].

1. Fire-Protection Rating: 1 hour.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Stainless-Steel Frames: Formed from stainless-steel sheet.
2. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.

2.9 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal resistant buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Section 283111 "Digital, Addressable Fire-Alarm System."

E. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall jamb-mounted units.

2.10 FINISH MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

B. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cylinder in protective casing within well hole. Before installing protective casing, remove water and debris from well hole.

1. Fill void space between protective casing and cylinder with corrosion-protective filler.
2. Align cylinder and fill space around protective casing with fine sand.

B. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor. Seal between protective casing and pit floor with 4 inches of nonshrink, nonmetallic grout.

C. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.

D. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualification standards.

E. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

F. Install piping above the floor, where possible. Install underground piping in casing.

1. Excavate for piping and backfill encased piping according to applicable requirements in Section 312000 "Earth Moving."

G. Lubricate operating parts of systems as recommended by manufacturers.

H. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

I. Leveling Tolerance: 1/4 inch , up or down, regardless of load and travel direction.

J. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION 142400

SECTION 210500 – SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. The fire protection work covered by this section consists of furnishing all labor, materials, tools, equipment, services, and supervision required to install, test, and place in service complete fire sprinkler system(s) and one dry-pipe sprinkler system. Work shall also include installation of the standpipes and the installation of backflow prevention assemblies and underground lead-in connections.

B. The work shall be in accordance with NFPA 13 (2013 Edition) and shall be completed as indicated on the drawings and specified herein.

C. The design drawings associated with these specifications are conceptual in nature and are not shop drawings but serve as a reference for pipe sizing, general pipe routing and layout, and basic system configuration. The Contractor is to provide a complete shop drawing submittal, including all information required by NFPA 13. Shop drawing submittals shall indicate all pipe lengths, elevations and offsets as coordinated with all trades.

D. All work shall be executed and inspected in accordance with all state codes, rules, ordinances, and regulations pertaining to the work involved. Should any change in the contract drawings or specifications be required to conform to such requirements, the Engineer shall be notified at the time of bid submittal.

E. After entering into the contract, the Contractor shall be held responsible for the completion of all work necessary for a complete and approved installation without extra expense to the Owner.

F. The Contractor shall prepare any supplementary detailed diagrams or drawings, which may be required by the state authority, local Authority Having Jurisdiction (AHJ) or Engineer.

G. Any deviations from the requirements of this specification must be acknowledged in writing with the supplier's bid offer.

H. Refer to Section 22 0525 for Seismic Requirements.

1.2 SYSTEM DESCRIPTION

A. Complete, integrated, and operating fire sprinkler system shall be installed throughout the Kansas Energy Center as specified herein and as shown on the drawings.

B. System shall include, but not be limited to: main control valves, sectional control valves, risers, connection to underground and fire department connection lead-in, piping, sprinklers, hangers, flow indication and supervisory switches and all accessories required to furnish complete operational system.

C. The building shall be served by a wet-pipe sprinkler system. Fire department connection shall be connected to the system at the sprinkler riser manifold.

1.3 SYSTEM DESIGN

A. The Contractor is required to perform hydraulic calculations.

B. Contractor shall provide all flow test and hydraulic calculation.

C. Where details of design, fabrication, and erection are not shown on the drawings or specified in this specification, the omitted details shall be in accordance with the requirements of NFPA 13 and their appendices.

D. No changes in pipe size, pipe arrangement, or addition of sprinklers shall be made in the field without prior approval of the Contractor's revised hydraulic calculations by the Engineer.

E. Unless specifically approved by the Engineer, no piping shall be installed exposed except in unfinished spaces.

1.4 SUBMITTALS

A. General

1 The Contractor shall submit three sets of shop drawings, calculations, as-built drawings and product data to the Engineer for approval.
2 No work, fabrication, or installation may proceed without the Contractor having received written approval from the Engineer, Owner's insuring party and local Authority Having Jurisdiction, as applicable.
3 Any changes to or deviations from approved drawings require resubmittal and written approval from the Engineer.

B. Shop/Working Drawings. The Contractor shall prepare and submit, prior to the commencement of any work (fabrication, installation, etc.), shop/working drawings as follows:

1 All Shop/Working Drawings and Material and Equipment Data shall be submitted to the engineer 100% complete and at one time.
2 The minimum scale shall be 1/8 inch equals 1 foot 0 inches, clearly indicating the essential details including all specialties, concealed spaces, ventilators, and possible obstructions. The Engineer will provide an electronic copy of the design drawings to the Contractor.
3 Drawings shall clearly indicate all information or data enumerated in Paragraph 23.1.3 of NFPA 13 for sprinkler systems.

C. Hydraulic Calculations.

1 Hydraulic Calculations are the responsibility of the Contractor. The calculations performed by the Engineer were to establish minimum pipe sizing and pipe schedule and will not be provided to the Contractor. Where piping segments are shown on the plans and pipe diameter is not clearly depicted, the minimum pipe sizing permitted shall be the greater pipe sizing of the adjacent and connected piping. Minimum pipe sizing for all arm-overs to single sprinklers shall be 1 inch.
2 Hydraulic calculations shall be prepared on form sheets that include a summary sheet, detailed work sheet, and a water supply versus demand graph.
3 Calculations submitted shall provide applicable data specified in Paragraph 23.3.5 of NFPA 13.

D. Material and Equipment Data

1 All Materials and Equipment Data shall be submitted to the engineer 100% complete and at one time.

2 The Contractor shall submit to the Engineer, prior to the commencement of any work (fabrication, installation, etc.), the name of the manufacturer and the type or model of each principal item of equipment or material proposed for installation. To accomplish this, it is acceptable to provide the manufacturer's descriptive, illustrated literature of all equipment, materials and devices.
3 The submittal shall provide positive indication of the specific size and description of the equipment, material or device used on this project. In other words, the data should be site specific, deleting any reference to options that do not apply to the project.

E. As-Built Drawings. Upon completion of the work, the Contractor shall revise all drawings to agree with the construction as actually accomplished and shall stamp such drawings "As-Built." One mylar reproducible copy and one electronic copy in Auto Cad, Release 14 or greater, shall also be provided.

F. Operations and Maintenance Manuals

1 The Contractor shall furnish operating instructions outlining the step-by-step procedures required for system start-up, operation, testing and take down procedures. The instructions shall include the manufacturer's name, model number, catalog cuts, diagrams, drawings, parts list and descriptive data covering the proper operation and testing of the system.
2 The Contractor shall furnish maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall reflect as-built conditions and include simplified diagrams for the system.
3 After approval of the shop drawings and no later than field acceptance testing, the Contractor shall provide a list of recommended spare parts and supplies, a current unit price and a source of supply.

G. Posted Instructions

1 Framed instructions under glass, showing the schematic layout of the entire system, shall be posted adjacent to the system riser.
2 Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely operating and shutting down the system shall be prepared in typed form and posted beside schematic drawings of the system.
3 Proposed drawings/diagrams, instructions, and other sheets shall be posted before acceptance testing of the system.

H. Certification and Field Test Reports

1 Hydrostatic reports shall be completed in accordance with Part III of this specification, NFPA 13 and NFPA 24. Hydrostatic testing shall be conducted at 200 psi for a period of two hours. **NOTE**: The Contractor shall utilize industry-accepted test reports (NFPA format) that provide sufficient detail on system components, tests completed, data collected and test results.
2 At least two weeks prior to requesting a final acceptance test of the fire protection system, the Contractor shall prepare and submit pre-operational test procedures that detail what is to be tested, how the tests are to be conducted and what acceptance (pass/fail) parameters for the various tests and test equipment will be required. The test report shall provide a table indicating final valve position and optimum settings on relief valves, pressure gauges, etc.
3 Upon completion of pre-operational testing, three (3) copies of the test reports shall be submitted in booklet form detailing the tests performed, data collected, adjustments made, and any other necessary actions required to prove compliance with the specified

performance criteria. Each test report shall indicate the final position of all valves and setpoints on pressure gauges and relief valves on wet pipe systems.

4 Tests shall be completed in accordance with Part III, in this Specification. The Contractor is responsible for providing all test equipment necessary in the performance of field acceptance testing.

5 The Contractor and the Owner's Representative shall sign off on all test reports.

1.5 QUALITY ASSURANCE

A. All materials and equipment furnished and installed under this section shall be new and currently listed by Underwriters Laboratory (UL) or approved by Factory Mutual (FM) for the intended application, except as otherwise specified herein.

B. Development of shop drawings and hydraulic calculations shall be supervised by a NICET Level III or IV technician certified in automatic sprinkler system design or a registered professional engineer competent in sprinkler system design. Shop drawings shall be reviewed and sealed by the NICET Level III or IV technician. Shop drawing preparation shall be performed by a minimum NICET Level II technician.

C. The completion of this work shall be done by a qualified responsible contractor recognized as being fully experienced in the installation of sprinkler systems. The Contractor shall be licensed in the State of Kansas. The Contractor shall also be capable of demonstrating in writing for advance approval, 5 years of automatic sprinkler system installation experience.

D. The Contractor shall notify the Engineer before any significant changes are made to the original design.

E. All work shall be performed by competent workers skilled in the installation of automatic sprinkler systems.

F. All work shall be done in strict accordance with NFPA 13 and NFPA 24 and their appendices, and other applicable federal, state, and local codes and ordinances, except as otherwise indicated on the drawings or specified herein.

G. Before installation, the Contractor shall submit to the Engineer, in writing, evidence of experience and qualifications specified herein.

1.6 MAINTENANCE AND WARRANTY SERVICE

A. Furnish service and maintenance of the fire protection system installed under the provision of this section for a period of one (1) year from the Date of Acceptance by the Owner/Engineer. The maintenance for the first year, including the quarterly and annual testing and maintenance requirements as required by NFPA 25 shall be performed by the Contractor. Any required testing and maintenance cost for this maintenance and testing of the system shall be at no extra cost to the Owner and shall be included as part of this contract.

PART 2 - PRODUCTS AND MATERIALS

2.1 GENERAL

A. Material and equipment shall be as specified or as shown and shall be suitable for the service intended. Materials shall be new and unused, except for tests.

B. All materials and equipment furnished and installed under this section shall be listed by Underwriters' Laboratories, Inc., and/or approved by Factory Mutual Engineering Corporation, except as otherwise specified herein.

C. When two or more units of the same class of equipment are required, they shall be products from a single manufacturer.

D. All material and equipment necessary to meet the requirements of these codes shall be provided regardless of whether each item or device is specifically mentioned in this section or shown on the drawings.

2.2 DELIVERY, STORAGE AND HANDLING

A. Accept sprinkler components at job site in factory packing, inspect for damage, and comply with manufacturer's rigging and installation instructions.

B. Protect all piping, valves and associated components from physical damage, including effects of weather, water and construction debris.

C. Provide temporary inlet and outlet caps, maintain these protective caps in place until being installed or connected.

2.3 PIPE AND FITTINGS

A. Aboveground Pipe
1. Pipe used shall not be subject to a working pressure in excess of 25 percent of the hydrostatic pressure test required by ASTM A795, A53, or A135, as applicable.
2. All piping smaller than 2 ½" inches shall be Schedule 40 piping.
3. Piping 2 ½" inches and larger is permitted to be Schedule 10 (thinwall).
4. All piping on the system side of the dry-pipe valve shall be galvanized.
5. All piping 2 inch and smaller shall be black schedule 40 with threaded end.

B. Exposed Exterior Drain Piping
1. All drain piping and fittings on building exterior, and 6 inches inside building shall be galvanized, Schedule 40 piping.

C. Underground Pipe
1. Lead-in connection shall be Ductile Iron or approved equal.
2. Pipe shall be designed to withstand a system working pressure of not less than 175 psi.
3. Piping shall be listed for fire protection service and comply with the AWWA standards in Table 3-4.1 of NFPA 13, where applicable. Lead-in connection shall be ductile iron or approved equal from 5 feet outside building to backflow prevention assembly.

D. Joints: Joints shall conform to NFPA 13.
1. Shop welded joints will be permitted.
2. Roll-grooved pipe and fittings shall be prepared in accordance with manufacturer's latest published specification for the pipe material, wall thickness, and size.
3. Threaded joints will be permitted on Schedule 40 piping only.
4. Mechanical grooved pipe joints shall conform to AWWA C606. Joints shall be made using a UL listed or FM approved combination of fittings, gaskets, and grooves. Rolled pipe grooves shall be dimensionally compatible with the fittings.
5. Cut groove piping and fittings are not permitted.
6. All piping 2 inches and smaller shall be threaded.

E. Fittings: Fittings for piping shall be threaded and approved for use in sprinkler systems.

F. Reducers: Reductions in pipe shall be made with one-piece reducing fittings.

G. Bushings: Bushings will not be acceptable.

H. Hangers have not been shown on the design drawings and are the responsibility of the Contractor.

I. All hangers and supports shall be provided in accordance with provisions of NFPA 13.

2.4 PIPE SLEEVES

A. All penetrations through concrete block walls or concrete floor/ceilings shall be core drilled.

B. Where pipes pass through fire walls, fire partitions, or rated floors, a qualified fire stopping material shall be provided. The Contractor shall submit to the Engineer for approval, supporting documentation that the proposed firestopping material is UL Listed or FM approved for the type of penetration and required fire rating.

C. A water tight penetration sealant shall be used to seal all penetrations that are in walls or floor/ceilings that are not fire walls, fire partitions, or rated floors.

2.5 VALVES

A. General:
1. Utilize valves that allow moving parts to be changed out without removing the valve from the installed position.
2. General Purpose Type: General purpose valves shall be OS&Y valves of an FM approved or UL listed type.
3. All new control and isolation valves shall be electronically supervised. All tamper switches are to be provided by the sprinkler contractor.
4. Check valves shall be an FM approved and UL listed iron body bronze trimmed swing check.

2.6 SPRINKLERS

A. Sprinklers shall conform to the UL Fire Protection Equipment Directory for the required application and as shown on the drawings.

B. Clearances between deflectors and ceiling, roof decking, roof joists, electric or heating equipment, or other obstructions shall be in accordance with NFPA 13.

C. Sprinkler temperatures shall be Ordinary Temperature classification and in accordance with NFPA 13.

D. In patient accessible areas, all sprinklers less than 9 ft 8 inches above the finished floor shall be institutional.

E. Sprinklers shall be of the following type:

1. Standard Spray Quick Response Upright; K = 5.6; Brass.
2. Standard Spray Quick Response Pendent; K = 5.6; White Semi-Recessed.

3. Standard Spray Dry Pendent; K = 5.6; Chrome Semi-Recessed.
4. Standard Spray Quick Response Institutional Pendent; K = 5.6; Chrome Semi-Recessed.

2.7 SYSTEM SPECIALTIES

A. Waterflow Indicators
1. Vane type waterflow switches shall be Potter Model VSR-F or equivalent.
2. Pressure switches shall be Potter Model PS10A or equivalent.
3. Switches shall be provided with a ½ -in. NPT.
4. Switches shall be actuated by any flow of water to or in excess of the discharge from one sprinkler.
5. Switches shall have a maximum service pressure rating of 250 psi and shall be factory adjusted to operate on pressure increase at 6 ± 1 psi.

B. Tamper Switches:

1. Potter Model OSYSU-1 or equivalent.

C. Spare Sprinklers, Sprinkler Cabinet and Wrench:
1. Provide steel, baked red enameled, sprinkler box with capacity to store 10 sprinklers and wrench sized to sprinklers. In all cases: sprinkler box capacity must equal or exceed the number of spare sprinklers required. There shall be minimum one sprinkler cabinet at each riser manifold location.
2. For each style and temperature range required, furnish additional sprinklers, amounting to 1 unit for every 100 installed units, but not less than 5 units each.

D. Backflow Prevention Assembly
1. Backflow preventer shall be FEBCO Model 870/870V, or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. SPRINKLER SYSTEMS:
1. Provide a placard permanently attached to the system riser indicating the hydraulic design details as required by NFPA 13, Section 23.1.3.
2. Clearances between deflectors and ceiling, roof decking, roof joists, electric or heating equipment, or other obstructions shall be in accordance with NFPA 13.
3. Install sight glass in the inspector's test connections.
4. Route drains to locations referenced on plans. Coordinate with Owner for drain location. Drains must be capable of handling full discharge under normal system pressure. The use of floor drains is not permitted.
5. All sprinklers must be of the same manufacturer and model designation.
6. Replace any painted or paint spotted sprinklers.
7. At no location shall Auxiliary drains be permitted. All piping shall be installed such that no more than 5 gallons capacity is trapped at any one location.

3.2 FABRICATION AND INSTALLATION:

A. Piping:

1. Torch cutting and welding will not be permitted as a means of modifying or repairing sprinkler systems.
2. Welding shall be done in strict compliance with ASME Boiler and Pressure Vessel Code, Section IX.
3. No piping shall be installed to obstruct the removal or access to equipment for maintenance or access.

B. Supports:
1. All supports and hangers shall be in accordance with NFPA 13.
2. Support risers and valve headers as required by code.
3. No piping shall be supported from bottom cord of bar joists.

C. Valves and Accessories:
1. Install indicating control valves as shown on drawings.
2. Install valve tamper supervision switches on indicating control/zone valves.

D. Drain and Test Connections:
1. Provisions shall be provided to properly drain all parts of the systems.
2. System main drains, test drains, and auxiliary drains shall be in accordance with applicable sections of NFPA 13.
3. Inspector test connections for systems shall be restricted orifice and equipped with a site glass.
4. Install main drain and drain piping at low points of sprinkler piping.

3.3 IDENTIFICATION AND MARKING

A. All drain and test valves, provided by the fire protection Contractor in accordance with this specification section shall be identified by the attachment of durable metal or plastic tags upon which the valve function or description shall be embossed/engraved.

NOTE: Labeling and posted operating procedures shall incorporate the identification system established by the Owner/Engineer (as applicable).

B. Tags shall be bound securely to the valve by means of stainless steel wire or adhesive glue for control panels. In all cases, the tags will be bound in such a position as to present minimum opportunity for loss and maximum visibility. In no case will the tags be attached to handwheels.

3.4 PAINTING

A. All sprinkler piping in mechanical rooms, electrical rooms, sprinkler riser rooms shall be painted red to indicate fire protection.

3.5 TESTING AND CLEANING

A. Cleaning shall be in accordance with NFPA 13.

B. All tests shall be witnessed by the Engineer or State inspector. It is a responsibility of the Contractor to provide adequate notice, a minimum of ten working days, to the Engineer and State Inspector of all testing to be performed..

C. Hydrostatic Tests
1. Piping shall be hydrostatically tested at not less than 200 PSI for two hours.

2. Prior to the commencement of field tests, one certified copy of the Contractor's Material Test Certificate for hydrostatic tests shall be submitted to the Engineer.
3. All system piping must be thoroughly flushed and free from foreign material.

D. Acceptance Testing
1. The Contractor shall perform acceptance tests specified in NFPA 13 and NFPA 24. The following tests shall be conducted, but not limited to:
a Hydrostatic test
b Flush test
c Waterflow tests
d Main drain flow tests
e Alarm and supervision tests
f Operational tests

E. In the event that any system or component fails to meet the guarantees, and the Contractor has made such alterations and modifications as he feels necessary to obtain the guaranteed performance, the system(s) shall be retested. The entire expense of the additional tests required to demonstrate the effects of such alterations and modifications shall be borne by the Contractor. The "entire expense" shall be interpreted as all outside charges incurred during the retesting other than for use of the normal operating forces of the Owner.

F. All final field acceptance tests shall be witnessed by representatives from the local authority having jurisdiction, insuring interest, Owner, and Engineer.

3.6 Test Documentation. Documentation specified in this specification shall be submitted to the Engineer within 30 days of completion of satisfactory testing.

END OF SECTION 21 0500

SECTION 22 0500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL PROVISIONS

1.1 CONTRACT DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications preceding this division of this specification are applicable to contractors, subcontractors, and material suppliers.

1.2 SPECIFICATION FORM AND DEFINITIONS

A. These Specifications are abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the contractor shall", "shall be", "as noted on the Drawings", "according to the drawings", "a", "an", "the" and "all" are intentional. Omitted words and phrases shall be supplied by inference.

B. The term “Engineer”, "Engineer", or “Engineer” wherever used in these specifications, shall mean LATIMER, SOMMERS & ASSOCIATES, P.A., 3639 SW SUMMERFIELD DRIVE, SUITE A, TOPEKA, KANSAS 66614, PHONE 785-233-3232, FAX 785-233-0647.

C. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with Owner to perform this work.

D. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires Engineer's review.

E. "Provide" means furnish and install.

F. Engineer hereinafter abbreviated A/E shall mean both the Design Engineers and the Design Engineers.

G. Equipment and/or materials manufacturer hereinafter abbreviated E/M shall mean the manufacturer of equipment or materials specified or referred to.

H. When the term “equivalent” is used in context to products or manufacturer’s, the equivalency of the proposed product or manufacturer to be used in lieu of the specified product or manufacturer is the sole decision of the A/E.

1.3 QUALIFICATIONS

A. The contractor responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractor shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractor shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.4 LOCAL CONDITIONS

A. Visit site and determine existing local conditions affecting work in contract.

B. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.5 CONTRACT CHANGES

A. Changes or deviations from Contract, including those for extra or additional work must be submitted in writing for review of Engineer. No verbal orders will be recognized.

1.6 LOCATIONS AND INTERFERENCES

A. Location of equipment, piping and other mechanical work is indicated diagrammatically on the Drawings. Determine exact locations on job, subject to structural conditions, work of other sections of the Specifications, access requirements for installation and maintenance and approval of Engineer.

B. Study and become familiar with the Drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with work of other trades, and install work in such a way as to avoid interference with work of other trades. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed by Engineer prior to installation.

C. Any pipe, apparatus, appliance or other item interfering with proper placement of other work as indicated on Drawings, specified, or required, shall be removed and if so shown, relocated and reconnected without extra cost. Damage to new or existing work caused by Contractor shall be restored as specified for new work.

D. Do not scale Drawings for dimensions. Accurately lay-out work from dimensions indicated on Drawings unless such be found in error.

E. Report any conflict stated above to supervisor for coordination.

1.7 PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.

1.8 TEMPORARY UTILITIES

A. Contractor shall provide temporary utilities as indicated in 015000 during construction.

1.9 WARRANTY

A. The plumbing systems are to be warranted to Owner and Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from acceptance of electrical systems by Owner.

B. Contractor warrants to Owner and Engineer that on receipt of notice from either of them within one year of warranty period following date of acceptance all defects that have appeared in materials and/or workmanship, shall be promptly corrected to condition required by contract documents at contractor expense.

C. The warranty above expressed shall not supersede any separately stated warranty or requirements required by law or by these specifications.

1.10 ALTERNATES

A. Refer to General Requirements and description for alternate bid items.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for bidder to use its ingenuity and abilities to perform the work to its and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.

B. Material and equipment provided shall be first class quality, new, unused and without damage unless noted otherwise.

C. In general, these specifications identify required materials and equipment by naming first the manufacturer whose product was used as the basis for the project design and specifications. The manufacturer's product, series, model, catalog and/or identification numbers shall set quality and capacity requirements for comparing the equivalency of other manufacturer's products. Where other manufacturer's names are listed they are considered an approved manufacturer for the product specified, however; the listing of their names implies no prior approval of any product they may propose to furnish as equivalent to the first named product unless specific model or catalog numbers are listed in these specifications or in subsequent addenda. Where other than first named products are used for base bid proposal it shall be the responsibility of the Contractor to determine prior to bid time that the proposed materials and equipment selections are products of approved manufacturers which meet or exceed the specifications and are acceptable to the Engineer.

D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Engineer for review prior to procurement.

E. Prior to receipt of bids, if the Contractor wishes to incorporate products other than those named in the specifications or drawings they shall submit a request for approval of equivalency in writing to the A/E no later than (10) ten calendar days prior to bid date. Engineer will review requests and acceptable items will be listed in an Addendum issued to principal bidders. Equivalents will ONLY be considered approved when listed by project addendum. Substitutions after this may be refused at Engineers option.

F. Materials and equipment proposed for substitution shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two (2) copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison. .In proposing a substitution prior to receipt of bids, include in such proposal cost of altering other elements of project, including adjustments in mechanical/electrical service requirements necessary to accommodate such substitution.

G. In proposing a substitution prior to receipt of bids, include in such bid all costs of altering other elements of the project, including such items as adjustments in mechanical/electrical service requirements necessary to accommodate such substitutions. In addition, all physical space and weight requirements requiring additional structural support, modifications to the base floor plans, equipment concrete pad/roof curb dimensions shall be incorporated as required into such bid to accommodate such substitutions.

H. Within ten (10) working days after bids are received, apparent low bidder shall submit to A/E for approval three copies of a list of all major items of equipment he intends to provide. As soon as practicable and within ten (10) working days after award of contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work for Engineer's review. Where ten (10) working day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such

detailed shop drawings will be submitted along with manufacturer's certifications that order was placed within ten (10) working day limit.

PART 3 EXECUTION

3.1 SHOP DRAWINGS

A. Contractor shall furnish shop drawings of all materials and equipment. Submittals shall be submitted electronically. In addition, a minimum of (3) paper copies of any submittal that contains informational drawings or documentation that is in a format larger than 8-1/2 x 11shall be submitted to the A/E. A/E will return the submittals to the Contractor electronically except that a copy of large format submittals will be returned to the contractor via mail. A copy of fully processed product data submittal shall be included as a part of each operating and maintenance manual.

B. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc., that are to be provided. Mark each submitted item with applicable section and paragraph numbers of these specifications, or Drawing sheet number when item does not appear in specifications. Where equipment submitted does not appear in specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization. Each submittal shall contain at least four sets of original catalog cuts. Each catalog sheet shall bear Equipment Manufacturer’s name and address. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor shall be required to submit all applicable equipment/material assembly mock-ups as required by the Contract Documents for Engineer approval. Contractor shall provide changes and resubmit mock-ups until Engineer is satisfied final product meets or exceeds stated specifications and quality of specified product.

D. Contractor shall check all shop drawings to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Engineer for their review.

E. All shop drawings submitted to Engineer shall bear Contractor's approval stamp which shall indicate that Contractor has reviewed submittals and that they meet specification and drawing requirements. Contractor’s submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed, electrical characteristics, provisions for supply, return and drainage connections to building systems. All shop drawings not meeting Contractor's approval shall be returned to its supplier for resubmittal.

F. No shop drawing submittals will be considered for review by the Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of Contractor's review. All comments or minor notations on shop drawings shall be flagged to indicate originator of comment.

G. Engineer will not be responsible for or the cost of returning shop drawing submittals that are submitted without Contractor's review and approval stamp. A letter will be sent to Contractor by either the Engineer or Engineer indicating receipt of an improper submittal for pick-up by Contractor or supplier for 15 working days after date of receipt. If not picked up by the 16th working day, submittals not bearing Contractor’s review and approval stamp will be disposed of by Engineer.

H. Engineer's review of shop drawings will not relieve Contractor of responsibility for deviations from drawings and specifications unless such deviations have been specifically approved in writing by Owner or its representative, nor shall it relieve Contractor of responsibility for errors in shop drawings. No work shall be fabricated until Engineer's review has been obtained with “no exceptions” or “as noted” language. Any time delay caused by correcting and resubmitting shop drawings will be Contractor's responsibility.

I. The preparation of coordination drawings are not a requirement of the project unless otherwise indicated on the drawings. It is strongly recommended, however, that the various contractors work

together to prepare detailed coordination drawings in an effort to minimize conflicts created as the various trades install their particular portion of the work. The design team will assist the contractor in resolving coordination conflicts by reviewing these coordination drawings; however, this review will not constitute any approval of said drawings. There will be no additional compensation for deviations in pipe, ductwork or conduit routing required to achieve coordination of the material and equipment scheduled or indicated to be installed as a part of the project. There will be no additional compensation for the rework of pipe ductwork or conduit should this become required as a result of a lack of coordination between the various trades.

J. Contractor shall submit the following items for this project:

1. All valves
2. All domestic water piping and all associated hangers/mounting devices
3. All piping insulation
4. All plumbing fixtures, carriers etc.
5. All drain, waste, vent and roof drain piping
6. All floor and roof drains
7. All plumbing specialties including but not limited to back flow preventers, cleanouts etc.
8. Domestic water heaters
9. Water softeners
10. Fire protection sprinkler systems

3.2 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

A. Submit an outline copy of installation, operating, and maintenance manuals for review and comment.

B. Submit three copies of installation, operating, maintenance instructions, and parts lists for equipment provided. After receiving comments from outline review. Instructions shall be prepared by equipment manufacturer.

C. Keep in safe place, keys and wrenches furnished with equipment under the Contract. Present to Owner and obtain receipt for same upon completion of project.

D. Prepare a complete notebook, covering systems and equipment provided and installed under this contract. Submit notebooks to Engineer for review before delivery to Owner. Contractor at his option may prepare this notebook, or retain an individual to prepare it for him. Contractor shall include cost of this service in bid. Notebook shall contain following:

1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined under this specification.
2. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
3. A complete set of approved final shop drawings.
4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of the systems installed.
5. As-Built Drawings: The Contractor shall mark up a set of contract documents during construction noting all changes and deviations including change orders. These will be delivered to A/E at end of the project for review and correction as required. After the originals are changed to reflect the blue line set, a complete set of reproducible set of project record drawings drawn at the original scale indicated shall be included in the brochure.
6. All required warranties and guarantees, including start and end date of warranties/guarantees.

E. Provide notebooks bound in black vinyl three-ring binders. Reinforce binding edge of each sheet of looseleaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:

1. Project name and address.
2. Section of work covered by brochure, e.g. "Plumbing", etc.

F. In addition to the hard copy of the operating and maintenance manuals, submit an electronic copy. The electronic copy shall be submitted either on compact disc, DVD or flash drive.

3.3 CUTTING AND PATCHING

A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Cut no structural members without Engineer's approval and in an approved manner.

B. Patching shall be by mechanics of particular trade involved and shall meet approval of Engineer.

C. Drilling and cutting of openings through building materials requires Engineer's review and approval. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work is not acceptable.

3.4 MUTILATION

A. Mutilation of building finishes or existing/new equipment, caused by demolition or installation of new work shall be repaired at Contractor's expense to approval of Engineer.

3.5 WALL PENETRATIONS

A. Include the installation of all boxes, access panels and sleeves for openings required to install the work. All floor and wall penetrations shall be sealed to meet fire rating requirements using materials tested in accordance with ASTM E814.

3.6 OPENINGS, ACCESS PANELS & SLEEVES

A. Include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Set and verify the location of sleeves as shown on structural plans that pass through beams, only if so shown. All floor and wall penetrations be sealed to meet fire rating requirements. Access panels shall include those required to access fire dampers, VAV boxes, valves, smoke dampers, pipe chases, manual and automatic dampers, etc. Locations and sizes of panels are to be determined by the contractor and are not specifically shown on the drawings.

3.7 FIRE STOPPING

A. All holes or voids created by the mechanical Subcontractor to extend pipe through fire rated floors and walls and shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall be ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, putty, strip and sheet forms. Equivalent by SpecSeal.

B. Submit for review firestopping methods and sleeve drawings indicating all required application, methods and sleeves. Refer to engineering drawing for locations of fire rated partitions and floors.

C. All wall and floor penetrations will require firestopping.

3.8 SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set all equipment level on adequate supports and provide proper anchor bolts and isolation as shown or specified. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.

B. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best recognized practice. Contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required. Contractor shall verify that structural members of building are adequate to support equipment. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Engineer for review before proceeding with fabrication or installation.

3.9 START-UP, CHANGEOVER, TRAINING AND OPERATION CHECK

A. Contractor shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.

B. All owner training sessions shall be orderly and well organized and shall be professionally video recorded using digital format. Contractor shall produce a DVD of each training session and submit to Owner as part of the Operation and Maintenance Manual submittal.

3.10 PRE-FINAL AND FINAL CONSTRUCTION REVIEW

A. At Contractor’s request, Engineer will make pre-final construction review to determine if to the best of its knowledge project is completed in accordance with Contract Documents.

B. Items found by Engineer as not complete or not in accordance with requirements of contract will be outlined in report to Engineer for forwarding to Subcontractors. Subcontractor shall complete and/or correct these items, before notifying Engineer it is ready for final review.

C. All necessary system adjustments, including air systems balancing, shall be completed and all specified records and reports submitted in sufficient time to be received by Engineer at least ten working days prior to date of final construction review.

D. At final construction review, Contractors shall be present or shall be represented by a person of authority. Each shall demonstrate, as directed by Engineer that work complies with purpose and intent of contract documents and shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 22 0500

SECTION 22 0501 - EXTENT OF CONTRACT WORK AND CODES

PART 1 - GENERAL (Reference Section 220500)

1.1 GENERAL EXTENT OF WORK INCLUDED IN CONTRACT

A. Provide plumbing systems indicated on Drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of plumbing systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.

B. Become familiar with equipment provided by other Subcontractors which require plumbing connections and controls.

C. Electrical work required to install and control plumbing equipment which is not indicated on Drawings or specified under Division 26 shall be included.

D. The cost and provision of larger wiring, conduit, control, and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be provided at no increase in contract price.

E. Provide supervision to subcontractor to insure that required connections, interlocking and interconnection of mechanical and electrical equipment are made to attain intended control sequences and system operation.

F. Furnish electrical wiring diagrams to Engineer and three Electrical Subcontractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Subcontractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.

G. Obtain complete electrical data on mechanical shop drawings and list this data on an approved form which shall be presented monthly or on request, to Electrical Subcontractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of plumbing equipment such as capacity, HP, voltage, amperes, watts, locked rotor current to allow Electrical Subcontractor to order electrical equipment.

1.2 CODES, ORDINANCES, RULES AND REGULATIONS

A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal Governments, and other authorities having lawful jurisdiction.

B. Conform to latest editions and supplements of following codes, standards or recommended practices.

1. International Plumbing Code-2012.
2. International Mechanical Code-2012
3. International Building Code-2012.
4. National Electrical Safety Code Handbook H30- National Bureau of Standards.
5. Occupational Safety and Health Standard (OSHA) - Department of Labor.
6. NFPA No. 54 Gas Appliance & Gas Piping Installation
7. NFPA No. 70 National Electrical Code-2008
8. NFPA No. 90A Air Conditioning and Ventilating Systems
9. NFPA No. 91 Blower & Exhaust System
10. International Fuel Gas Code –2012
11. International Fire Code – 2012

MISCELLANEOUS CODES:
ANSI A117.1 - Handicapped Accessibility
Americans with Disabilities Act (ADA)

C. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Engineer in writing before proceeding with work so that necessary changes can be made. However, if Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

D. Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Engineer with request for final review.

PART 2 - PRODUCTS

2.1 DRAWINGS

A. Drawings are to be considered diagrammatic for all systems. All plumbing fixtures require waste, water and vent connections and they should be provided. Any plumbing vents, relief air openings, flues, exhaust openings, etc. must be placed 10’-0” from any outside air intakes. Piping and drawings do not show all required offsets and fittings. Contractor shall include in bid costs to provide systems which will avoid and coordinate will all other building trades and systems.

END OF SECTION 22 0501

SECTION 22 0525 - SEISMIC PROTECTION

PART 1 - GENERAL

1.1 GENERAL

Note: The requirements for seismic protection measures to be applied to mechanical/electrical equipment and systems specified herein are in addition to any other items called for in other sections of these specifications.

A. Seismic protection for mechanical equipment and components shall be provided by the Mechanical Contractor.

B. Seismic protection for electrical equipment and components shall be provided by the Electrical Contractor.

C. Seismic protection for general construction items, including suspended ceilings, shall be provided by the General Contractor.

1.2 MECHANICAL/ELECTRICAL EQUIPMENT

A. Mechanical/electrical equipment shall include the following items to the extent required on plans or in other sections of these specifications:

Boilers
Expansion Tanks
Water Chiller Units
Control Panels
Pumps with Motors
Light Fixtures
Motor Control Centers
Switchboards (Floor Mounted)
Suspended Ceiling Assemblies
Water and Gas Piping Drain, Waste and Vent Piping
Air and Refrigerant Compressors
Air Handling Units
Switchgear
Transformers
Ducts

1.3 MECHANICAL SYSTEMS

A. Mechanical systems shall include the following items to the extent required on plans or in other sections of these specifications:

Hot Water Distribution Systems
Chilled Water Distribution Systems
Gas Distribution Systems
Water Supply Systems
Sanitary Sewer Systems
Fire Sprinkler Systems

1.4 ZONE

A. This facility is located in Seismic Zone No. 2A.

1.5 EXCLUSION

A. Piping and ducts that do not require special seismic restraints: Seismic restraints may be omitted from the following installations:

1. Gas piping less than 1-inch inside diameter.
2. Piping in boiler and mechanical equipment rooms less than 1-1/4 inches inside diameter.
3. All other piping less than 2-1/2 inches inside diameter.
4. All electrical conduit less than 2-1/2 inches inside diameter.
5. All rectangular air handling ducts less than 6 square feet in cross sectional area.

6. All round air handling ducts less than 28 inches in diameter.
7. All piping suspended by individual hangers 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
8. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of the support for the hanger.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing Manufacturer's figure number, size, location, and features for each required pipe hanger and support.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly or components.

C. Maintenance Data: Submit maintenance data and parts lists for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

D. Shop drawings, along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed below shall be submitted in accordance with the SPECIAL CLAUSES. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

Sway Braces
Flexible Couplings or Joints
Resilient Type Vibration Devices
Smoke Stacks

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT SHALL CONFORM TO THE RESPECTIVE SPECIFICATIONS AND OTHER REQUIREMENTS SPECIFIED BELOW:

2.2 BOLTS AND NUTS

A. Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and B18.2.2, and ASTM A 307 or A 576.

B. Bolts, underground, ASTM A 325.

2.3 SWAY BRACE

A. Material used for members listed in Appendix of this specification, except for pipes, shall be structural steel conforming with ASTM A 36. Steel pipes shall conform to ASTM A 501.

2.4 FLEXIBLE COUPLINGS

A. Flexible couplings shall have same pressure ratings as adjoining pipe.

B. Flexible ball joints conforming to the following requirements may be employed on aboveground piping. Joints shall have cast or wrought steel casing and ball parts capable of 360-degree rotation plus not less than 15-degree angular movement. Joints shall be certified to be suitable for the service intended by the manufacturer, based on not less than 2 years' satisfactory operation in a similar application.

C. Flexible couplings and joints of the mechanical joint type may be used for aboveground or underground piping.

D. Mechanical couplings for steel or cast iron pipe shall be of the sleeve type and shall provide a tight flexible joint under all reasonable conditions, such as pipe movement caused by expansion, contraction, slight settling or shifting of the ground, minor variations in trench gradients, and traffic vibrations. Where permitted in other sections of these specifications, joints utilizing split-half couplings with grooved or shouldered pipe ends may be used.

E. Sleeve-type couplings shall be used for joining plain-end pipe sections. The coupling shall consist of one steel middle ring, two steel followers, two gaskets, and necessary steel bolts and nuts to compress the gaskets. Underground bolts shall be high-strength type as specified above.

F. Guy Wires: Guy wires shall conform to Fed. Spec. RR-W-410 as follows:

5/32 inch diameter	Type V, Class 1
3/16 inch to 5/16 diameter	Type V, Class 2
1/4 inch to 5/8 diameter	Type I, Class 2

PART 3 – EXECUTION

3.1 SWAY BRACES

A. Sway braces shall be installed on piping and duct to preclude damage during seismic activity. All bracing shall conform to the arrangements shown. Provisions of this paragraph apply to all piping within a 5-foot line around outside of building unless buried in the ground. Piping grouped for support on trapeze-type hangers shall be braced at the same intervals as determined by the smallest diameter pipe of the group. No trapeze-type hanger shall be secured with less than two ½-inch bolts. Bracing rigidity attached to pipe flanges, or similar, shall not be used where it would interfere with thermal expansion of piping.

3.2 SWAY BRACES FOR PIPING

A. Transverse Sway Bracing: Transverse sway bracing shall be provided at intervals not to exceed those given in Appendix of this section except for cast iron soil pipe, which shall be braced at not more than 10-foot intervals.

B. Longitudinal Sway Bracing: Longitudinal sway bracing shall be provided at 40-foot intervals.

C. Vertical Runs: Vertical runs of piping shall be braced at not more than 10-foot vertical intervals. For small tubing, bracing shall be provided at no more than 4-foot spacing.

D. Anchor Rods, Angles, and Bars: Anchor rods, angles and bars shall be bolted to either pipe clamps or pipe flanges at one end and cast-in-place concrete or masonry insert or clip angles bolted to the steel structure on the other end. Rods shall be solid metal or pipe as specified below. Anchor rods, angles, and bars shall not exceed lengths given in Appendix of this section.

E. Clamps on uninsulated pipes shall be applied directly to pipe. Insulated piping shall have clamps applied over insulation vapor barrier with high-density inserts and metal protection shields under each clamp.

F. Bolts: Bolts used for attachment of anchors to pipe and structure shall be not less than ½-inch diameter.

3.3 SWAY BRACES FOR DUCTS

A. Transverse Sway Bracing: Transverse sway bracing shall be provided at each horizontal turn of 45 degrees or more, at the end of each duct run, and otherwise at each 30-foot interval. Walls which ducts penetrate may be considered transverse braces.

B. Longitudinal Sway Bracing: Longitudinal sway bracing shall be provided at 60-foot intervals. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it, if the bracing is installed within 4 feet of the intersection, and it is sized for the larger duct.

C. Bracing Angles: Bracing angles for rectangular ducts shall be in accordance with Appendix of this section.

3.4 SPREADERS

A. Spreaders shall be provided between racked or adjacent piping runs to prevent contact during seismic activity whenever pipe or insulated pipe surfaces are less than 4 inches apart or four times the maximum displacement due to seismic force. Spreaders to be applied at same interval as sway braces. Spreaders shall be applied to surface of bare or insulated hot pipe and over insulation utilizing high-density inserts and pipe protection shields where vapor-barrier-type insulation is employed.

3.5 FLEXIBLE COUPLINGS OR JOINTS

A. Building Piping: Flexible couplings or joints in building piping shall be provided at bottom of all pipe risers larger than 3-1/2 inches in diameter, except thermal heat distribution piping.

B. Cast iron waste and vent piping need only comply with these provisions when caulked joints are used. Flexible bell and spigot pipe joints using rubber gaskets or no-hub fittings may be used at each branch adjacent to tees and elbows for underground waste piping inside of building to comply with these requirements.

C. Underground Piping: All underground piping and 4-inch or larger conduit, except thermal heat distribution system, shall have flexible couplings installed adjacent to building as shown. Additional flexible couplings shall be provided as follows:

1. On each side of the joints of demarkation between soils having widely differing degrees of consolidation.
2. At all points that can be constructed to act as anchors.
3. On every branch of a tee and each side of an elbow.

3.6 ANCHOR BOLTS

A. All floor or pad mounted equipment required by any Section of these specifications shall be rigidly fastened to the floor or pad by use of cast-in-place anchor bolts. Anchor bolts must conform to ASTM A 307. Anchor bolts shall have an embedded straight length equal to or at least 12 times nominal diameter of the bolt. If the size and number of the anchor bolts are not shown on the drawings then anchor bolts shall be ½" in diameter or the manufacturer's installation recommendations, whichever is the most stringent.

B. Four bolts per item shall be provided with a minimum embedment of 12 bolts diameters, a minimum bolt spacing of 16 bolts diameters and a minimum edge distance of 12 bolts diameters. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths.

C. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table.

3.7 RESILIENT VIBRATION ISOLATION DEVICES

A. Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure as in paragraph ANCHOR BOLTS except that an equipment weight equal to five times the actual equipment weight shall be used.

1. Resilient and Spring-Type Vibration Devices: Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 0.5 inches.

3.8 EQUIPMENT SWAY BRACING

A. Equipment sway bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes arranged as shown and secured at both ends with not less than ½-inch bolts. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45 degrees directed up and radially away from equipment and oriented symmetrically in 90 degree intervals on the horizontal plane, bisecting the angles of each corner of the equipment, provided that supporting members are properly sized to support operating weight of equipment when hangers are inclined at a 45 degree angle.

3.9 LIGHTING FIXTURES IN BUILDINGS

A. In addition to the requirements of the preceding paragraphs, lighting fixtures and supports will conform to the following:

B. Materials and Construction:

1. Fixture supports shall be malleable iron.
2. Loop and hook or swivel hanger assemblies for pendant fixtures shall be fitted with a restraining device to hold the stem in the support position during earthquake motions. Pendant-supported fluorescent fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.
3. Recessed fluorescent individual or continuous-row fixtures shall be supported by a seismic-resistant suspended ceiling support system and shall be provided with fixture support wires attached to the building structural members using two wires for individual fixtures and one wire per unit of continuous row fixtures.
4. A supporting assembly that is intended to be mounted on an outlet box shall be designed to accommodate mounting features on 4-inch boxes, 3-inch plaster rings, and fixture studs.
5. Surface-mounted fluorescent individual or continuous-row fixtures shall be attached to a seismic-resistant ceiling support system. Fixture support devices for attaching to suspended ceilings shall be a locking-type scissor clamp or a full loop band that will securely attach to the ceiling support. Fixtures attached to underside of a structural slab shall be properly anchored to the slab at each corner of the fixture.
6. Each wall-mounted emergency light unit shall be secured in a manner to hold the unit in place during a seismic disturbance.

C. Tests: In lieu of the requirements for equipment supports, lighting fixtures and the complete fixture-supporting assembly may be tested as specified hereinafter. Such tests shall be conducted by an approved and independent testing laboratory, and the results of such tests shall specifically state whether or not the lighting fixture supports satisfy the requirements given herein.

1. Test Equipment: To simulate earthquake motion, fixtures and supports shall be attached to a carriage suspended on rollers from an overhead track. A gear motor and crank assembly shall be used to provide oscillatory motion of approximately one cycle per second. The exact number of cycles per second and the actual dimensions of the crank apparatus shall be adjusted to produce a minimum carriage acceleration of 0.14g. The actual fixture-mounting surface shall be on the underside of the carriage and shall provide capacity for orienting the fixture in a horizontal plane in various positions, ranging from parallel to perpendicular to the line of traverse.
2. Test Requirements: All tests shall be conducted with the maximum fixture weight so as to produce the most severe loading conditions. Fixtures having stems shall be tested with the actual stem lengths to be used. Tests shall be of 1-minute duration with the mounting surface in the line of traverse, at 45 degrees to the line of traverse, and at 90 degrees to the line of traverse. A total of two fixtures shall be tested in each of the above positions. After each of the six tests, the complete stem assemblies from fixtures having stem assemblies shall be subjected to a tensile strength test. The sample shall withstand, without failure, a force of not less than four times the weight it is intended to support.
3. Acceptance: No component of a fixture nor its support shall be accepted individually. For acceptance, the fixture and its supports shall exhibit no undue damage, and no component of the fixture shall fail or fall from the fixture during testing.

D. Design Criteria: In lieu of the above test requirements, lighting fixtures shall be designed to resist a lateral force of 56 percent of the fixture weight.

E. Lighting Fixtures and Air Diffuser Supports: Lighting fixture and air diffuser supports shall be designed and installed to meet the requirements of equipment supports in the preceding paragraphs of this specification with the following exceptions:

1. Recessed lighting fixtures not over 56 pounds in weight and suspended and pendent-hung fixtures not over 20 pounds in weight may be supported and attached directly to the ceiling system runners by a positive attachment such as screws or bolts.
2. Air diffusers that weigh not more than 20 pounds and that receive no tributary loading from ductwork may be positively attached to and supported by the ceiling runners.

3.10 SMOKE STACKS

A. Stack shall be mounted directly on boilers or heat producing appliances or on floor supporting such devices with side inlets to stacks. All stacks must be supported with steel guys attached to a point three-fourths of the stack height external to the building. Guy wires shall be 1/4" 6 x 19 cable, improved plow steel with fiber core, as noted, with galvanized coating.

3.11 MISCELLANEOUS EQUIPMENT

A. The following specific items of equipment to be furnished under this contract shall be constructed and assembled so as to be capable of withstanding the horizontal equivalent static force of 0.11 times the operating weight of the equipment, at vertical center of gravity of the equipment without causing permanent deformation, dislocations, separation of components, or other damage, which would render the equipment inoperative for significant periods of time following an earthquake.

3.12 MISCELLANEOUS EQUIPMENT

Boilers
Cooling Tower
Air-Handling Units
Transformers
Switchboards and Switchgears
Motor Control Centers
Free Standing Electric Motors

3.13 APPENDIX

A. The following are reproductions from SMACNA Seismic Restraint Manual Chapters 4, 7 and 8 and contain details for duct, pipe conduit and equipment seismic restraint and shall be used for determining the required restraint for this project. The building shall be categorized seismic hazard level "C".

END OF SECTION 230510

SECTION 22 0550 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIRED WORK

A. Provide the reasonable identification of Plumbing piping as specified below.

PART 2 - PRODUCTS

2.1 PIPING IDENTIFICATION

A. Identify piping for all new domestic water piping at intervals indicated below. Provide color coded stencil markings for each type of pipe utilized and provide flow direction arrows. Provide standard stencils, prepared with letter sizes conforming to recommendations of ASME A13.1. Stencil paint shall be exterior use, oil-based, alkyd gloss enamel in colors according to ASME A13.1. Paint may be in pressurized spray-can form.

B. All letter stenciling shall be minimum 1-1/4” high. Colors and wording shall be as directed by the Owner, using standard colors and standard abbreviations of all services being identified. Contractor shall submit for approval list of colors and wording prior to purchase of pipe marking equipment/material/installation. Pipe markers shall meet applicable ANSI Standard and OSHA requirements.

Piping Section	Pipe Identification Spacing (max spacing)
Within tunnel system	20’-0” on center
Within mechanical spaces	
Within building	8’-0” on center
Within buildings in areas	
Where exposed to view	8’-0” on center
Within building above ceiling	10’-0” on center and within 3’ of a change in direction

2.2 VALVE IDENTIFICATION

A. Mark all valves with Seaton No. 300-BL brass identification tags with system legend, valve number and size stamped on tag. Lettering shall be black 1/2" high. Tags shall be minimum 2" in diameter and attached to valve with Seaton No. 16 brass jack chain. Contractor shall submit for approval list of identification markings and letterings prior to ordering tag material.

B. Prepare typewritten list of valve tags. List shall be typed in upper case and contain tag number, valve size, type, function and location. Provide copy of list electronically to Engineer prior to ordering tag material. Provide copy of final list to Owner. Final list shall be mounted in a frame in a location as directed by the Owner. A copy of the final list shall be included with each Operation and Maintenance Manual.

END OF SECTION 22 0550

SECTION 22 1100 – DOMESTIC WATER DRAIN, WASTE, VENT AND ROOF DRAIN PIPING

PART 1 - GENERAL (Reference Section 220500)

PART 2 - PRODUCTS

2.1 PIPING MATERIALS AND FITTINGS

A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. All materials listed may not be required on this project. See piping material schedule on the plans for materials to be used for each piping system. Piping materials shall be as follows:

B. Hubless Cast Iron Soil Pipe:

1. Pipe and fittings shall be gray cast iron with spigot bead and positioning lug. Pipe and fittings shall be coated inside and out with asphaltum preservative and shall meet requirements of current Cast Iron Pipe Institute Standard 301-69T.
2. Pipe joints shall be heavy-duty, no-hub joint couplings consisting of neoprene rubber sleeve, stainless steel shield and clamp assembly. ASTM A 74 “Extra Heavy” class.
3. Pipe and fittings shall be by Alabama Pipe, Tyler Pipe or Charlotte.
4. Pipe couplings shall be ANACO “Husky” or equal.

C. Polyvinyl Chloride Drain Waste:

1. Provide Schedule 40 polyvinyl chloride plastic drain waste and vent pipe conforming to ASTM D2665-88. Joints shall be properly cleaned, primed and glued.
2. Pipe by Charlotte, Genova, Crest or equal.

D. Copper Tube:

1. Provide hard temper copper water tube conforming to requirements of current ASTM Specification B-88. Tubing shall be Type K, L, or M as listed in schedule.
2. Tubing joints shall be soldered or brazed. See schedule for joining method to be used.
3. Provide wrought solder joint fillings conforming to ANSI Standard B16.22.
4. T-Drill is not approved for this project.
5. Pipe by Anaconda, Cerro, Chase, Mueller.

2.2 PIPING FITTINGS

A. Piping fitting used throughout project shall be proper type for installation method used and shall be compatible with piping system material. Fittings listed in piping material schedule.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Piping systems materials and installation shall conform with the following standards and codes.

System:	Plumbing System Piping
Code:	International Association of Plumbing & Mechanical Official's "Uniform Plumbing Code"

B. Pipe sizes indicated on plans and as specified refer to nominal size in inches for steel pipe,

cast iron pipe and copper tubing, unless otherwise indicated. Pipes are sized to nearest 1/2". In no case shall piping smaller than size specified be used.

C. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.

D. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.

E. Provide piping materials and wall thickness for specific piping systems as listed in piping schedule at end of this Section.

F. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.

G. Piping fitting materials for specific piping systems shall be as listed in piping schedules. Fitting shall be approved factory made type with threaded or weld ends as required. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.

H. Brazed socket type joints shall be made with suitable brazing alloys. Minimum socket depth shall be sufficient for intended service. Brazing alloy shall be end fed into socket, and shall fill completely annular clearance between socket and pipe or tube. Brazed joints depending solely upon a fillet rather than a socket type joint will not be acceptable.

I. Soft soldered socket type joints shall be made with sill-floss or 95-5 tin-antimony solder as required by temperature and pressure rating of piping system or as indicated on schedules. Soldered socket-type joints shall be limited to systems containing non-flammable and non-toxic fluids. Soldered socket-type joints shall not be used on piping systems subject to shock vibration. Soldered joints depending solely upon a fillet rather than a socket-type joint will not be acceptable.

J. Make changes in piping size and direction with approved factory made fittings.

K. Flanges in copper piping systems shall have a minimum rating of 150 PSIG. Flanges with a pressure rating of 125 PSIG will not be allowed.

L. Refer to schedules on plans for piping and fitting materials, additional installation requirements and for testing requirements for each application.

END OF SECTION 22 1100

SECTION 22 1300 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL (Reference Section 220500)

PART 2 - PRODUCTS

2.1 PIPE SLEEVES AND SEALS

A. Pipe insulation shall run continuous through pipe sleeves with 1/4" minimum clearance between insulation and pipe sleeve. Provide metal jackets over insulated pipes passing through fire walls, floors and smoke partitions. Jacket shall be 0.018 stainless steel extending 12 inches on either side of barrier and secured to insulation with 3/8" wide band. Seal annular space between jacket and pipe sleeves by installing backing rod and 3M. Hilti or equal fire barrier caulk.

B. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.

2.2 PIPE HANGERS AND SUPPORTS

A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.

B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.

C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position. Hangers shall not become disengaged by movements of supported pipe.

D. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.

E. Unless indicated otherwise on drawings support horizontal copper tubing as follows:

NOM. TUBING SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1"	3/8"	6Ft.
1-1/4" to 1-1/2"	3/8"	8 Ft.
2" and larger	3/8"	9 Ft.

F. Provide continuous threaded electro galvanized hanger rods wherever possible. No chain, wire, or perforated straps shall be used. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Engineer for review prior to fabrication.

G. Provide Grinnell pipe hangers for vertical pipe risers as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Copper	1/2" thru 4"	CT-121
Steel or Cast Iron	3/4" thru 16"	261

H. Support horizontal cast iron soil pipe with two hangers for each section located close to each hub. Use minimum 5/8” hanger rod for each hanger.

I. Support vertical cast iron soil pipe at every floor, steel and copper tubing at every other floor except where indicated otherwise on drawings.

J. Provide Grinnell Fig. 194, 195, or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.

K. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation. Provide Grinnell Fig. 167 insulation protection shields sized so that line compressive load does not exceed one-third of insulation compressive strength. Shield shall be galvanized steel and support lower 180 degrees of pipe insulation on copper tubing. Provide wood block at each pipe hanger in thickness of insulation. Insulation vapor barrier jacket shall overlap wood block to maintain vapor barrier.

L. Structural attachments for pipe hangers shall be as follows:

1. Concrete Structure: Provide expansion bolt or drop in expansion anchor for loads up to 400 lbs. unless otherwise noted on plans.
2. Structural steel beam: Provide Grinnell 133, 228 or equal as required by application.

M. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Copper	1/2" thru 4"	CT-65
Steel or Cast Iron	½” thru 4”	260

N. Provide Grinnell Fig. 296 vibration control hangers at locations where piping vibrations would be transmitted to building structure by conventional hangers. Apply hangers within their load supporting range.

O. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Engineer prior to installations.

2.3 EQUIPMENT ANCHORS

A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with concrete expansion anchors.
B. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

C. Equivalent hangers by Autogrip, B-Line, CHD Inc., or Power Strut.

END OF SECTION 22 1300

SECTION 22 1400 – GENERAL–DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Provide necessary valves within piping systems to provide required flow control and to allow isolation for inspection, maintenance and repair of each piece of equipment or fixture, and on each main and branch service loop.

B. Valves installed in piping systems shall be compatible with system maximum test pressure, pipe materials, pipe joining method, and fluid or gas conveyed in system.

C. Valves 2" and smaller shall have soldered or screwed end connections as required by piping materials unless otherwise specified or shown on drawings. Install union connection in the line within two feet of each screw end valve unless valve can be otherwise easily removed from line. Valves 2-1/2" and over shall have flange end connections.

D. Each valve shall be installed so that it is easily accessible for operation, visual inspection, and maintenance.

E. Provide butterfly valves in full lug body style. Butterfly valves in sizes 6" and below with latchlock handles for On-Off applications and with Twist-Lock infinite position handle for throttling applications. All butterfly valves in sizes larger than 6” shall be provided with gear operators and wheel handles.

F. Install globe valves with pressure on top of disc except that must be completely drained for inspection, maintenance or to prevent freezing shall be installed with stem in horizontal position to insure complete drainage of pipe lines.

G. All valve type used in plumbing systems shall be equivalent valves listed on current comparison charts of specified valve manufacturers by Crane, Centerline, Dyna Quip, Demco, Hammond, Jenkins, Jamesbury, Keystone, or Powell will be acceptable.

PART 2 - PRODUCTS

2.1 BALL VALVES

A. Provide valves based on sizes, piping system served, and piping material indicated in the valve schedule shown on plans.

2.2 BUTTERFLY VALVES

A. Provide full lug body valves based on sizes, piping system served, and piping material indicated in the valve schedule shown on plans.

2.3 CHECK VALVES

A. Provide valves based on sizes, piping system served, and piping material indicated in the valve schedule shown on plans.

2.3 BALANCE VALVES

A. Provide valves based on sizes, piping system served, and piping material indicated in the valve schedule shown on plans.

PART 3 – EXECUTION

END OF SECTION 22 1400.

SECTION 22 1500 – PLUMBING PIPING INSULATION

PART 1 - GENERAL (Reference Section 220500)

1.1 GENERAL REQUIREMENTS

A. Provide necessary materials and accessories for installation of insulation for plumbing systems as specified and/or detailed on drawings insulation type, jacket, and thickness for specific piping systems or equipment shall be as listed in insulation schedule.

B. Provide insulation materials manufactured by Armstrong Cork Co. Certain/Teed Saint Gobain, Dow Chemical, Johns-Manville or Owens-Corning Fiberglass.

C. Insulation, except where specified otherwise, shall have composite fire and smoke hazard ratings as rested by ASTM E-84, NFPA 255, and UL 723 procedures not exceeding:

FLAME SPREAD	25
SMOKE DEVELOPED	50
FUEL CONTRIBUTED	50

D. Provide insulation accessories such as adhesives, mastics, cements, tape and glass fabric with same component ratings as listed above. Products or their shipping cartons shall bear label indicating their flame and smoke safety shall be permanent. Use of water soluble treatments such as corn paste or wheat paste is prohibited. This does not exclude approved lagging adhesives.

E. Install insulation over clean dry surfaces with joints firmly butted together. Insulation at equipment, flanges, fittings, etc. shall have straight edges with box type joints with corner beads as required. Where plumbing and heating insulation terminates at equipment or unions, taper insulation at 30 degree angle to pipe with one coat finishing cement and finish same as fittings. Total insulation system shall have neat smooth appearance with no wrinkles, or folds in jackets, joint strips or fitting covers.

F. Undamaged insulation systems on cold surface piping and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.

G. Where glass fabric is specified in the following insulation methods provide resin impregnated white open weave glass fabric with 10/20 thread count. Provide glass cloth similar to Alpha Martex wettable glass cloth.

H. Abbreviations for manufacturers of adhesive, mastics and coating specified shall be C.M. for Chicago Mastic Company and B.F. for Benjamin Foster Company.

I. Insulation of removable heads, manholes access covers, etc., shall be fabricated to allow removal without damage to insulation. Provide removable units with vapor-proof cover fabricated to be sealed to equipment vapor barrier.

J. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Mechanical Contractors expense at no cost to owner.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS AND APPLICATION METHODS (PIPING)

A. Pipe insulation by type shall be as follows:

1. TYPE 1-PHC: Insulation for hot and cold surface piping systems with -60 degrees F to +650 degrees F operating range shall be Owens-Corning Fiberglass ASJ/SSL-11, 4.2 lb. density pipe insulation with white fire retardant ASJ jacket and double self-sealing lap. Average thermal conductivity shall not exceed .26 BTU/Hr. at 75 degrees F mean temperature. Seal longitudinal jacket laps and butt strips with C.M. No. 17-465 or B.F. No. 85-75 vapor barrier adhesive. Insulate valves and fittings as follows:

a. Insulate exposed and concealed valves and fittings with 2" thick glass fiberglass inserts or blankets. Cover fittings with Zeston Products PVC fitting covers or approved equal. PVC fitting covers shall be secured with mechanical fasteners such as tacks or staples for temperatures above 75 degrees F. For cold service all joints shall be sealed with vapor barrier adhesive or by pressure sensitive vapor barrier vinyl tape.

PART 3 – EXECUTION

3.1 INSULATION MATERIAL AND THICKNESS

A. Pipe insulation schedule

1. Refer to the piping insulation schedule on plans for pipe insulation material, thickness and installation requirements.

END OF SECTION 22 1500

SECTION 22 3125 - SEWAGE EJECTORS, SUMP PUMPS AND ASSOCIATED PIPING SPECIALTIES

PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS

2.1 FOUNDATION DRAINAGE AND TUNNEL DRAINAGE SUMP PUMP and ELEVATOR PIT DRAINAGE SUMP PUMP

A. Finish and install, where shown and as scheduled on plans. Weil simplex and duplex submersible sewage pump system.

B. The pump case shall be one piece cast iron constructed with integral tripod support legs that provide an even distribution of weight.

C. Pump motor shall be vertical, NEMA-6, with electrical characteristics as indicated in schedules on plans. They shall be air filled, hermetically sealed with built-in Auto-Reset Thermal/Overload protection. Oil filled motor shall not be considered equal.

D. Motor end bell shall be designed as terminal box and separated from the motor shell by a combination bearing support and inspection plate.

E. Motor shall be housed in a watertight cast iron shell with Class F insulation with permanently lubricated upper and lower ball bearings. Motor shaft shall be 300 series stainless steel. Motors using sleeve type bearings, carbon steel shafts or motors requiring cooling jackets shall not be considered equal.

F. The impeller shall be multi-vane semi-open and accurately machined to the proper diameter and capable of passing 2 inch solids. All impellers are to be statically and dynamically balanced.

G. A single mechanical seal with carbon ceramic seal faces shall be provided.

H. Controls: Provide NEMA 1 control panel and differential float switches for on, off operation. Provide differential float switch for high water alarm and associated high water alarm horn and light in control panel. Provide reset button silencing switch and Hand-Off Auto switch. Control panel shall be configured for a dry set of alarm contacts which shall be provided for binary input to JCI for remote monitoring.

I. Oil sensing unit shall be provided in the elevator pit sump pump to prevent pump operation should oil be sensed in the sump basin.

J. Refer to details and schedules on plans for pump, basin and cover requirements.

K. Equivalents by Bell & Gossett.

PART 3 - EXECUTION (Not Applicable)

A. All pumps shall be installed in strict conformance with manufacturer’s installation instructions.

B. All pumps shall be checked prior to start up by factory authorized service/startup technicians.

C. All pumps shall be started by factory authorized service technicians.

END OF SECTION 22 3125

SECTION 22 3150 - FUEL OIL TRANSFER PUMPS

PART 1 - GENERAL (Reference Section 220500)

1.1 GENERAL REQUIREMENTS

A. Furnish and install where shown on plans , fuel oil transfer pumps as indicated in pump schedule on the drawings.

1.2 EQUIVALENT MANUFACTURERS

A. Equivalents by Roper, Blackmer.

1.3 SUBMITTALS

A. Submit drawings indicating components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate accessories where required for complete system.

B. Submit product data indicating rated capacities, weights, and specialties and accessories.

C. Submit manufacturer's installation instructions.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include start-up instructions, maintenance data, controls, and accessories.

1.5 STORAGE AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include start-up instructions, maintenance data, controls, and accessories.

1.7 STORAGE AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from damage.

PART 2 - PRODUCTS

2.1 FUEL OIL TRANSFER PUMPING UNIT

A. Provide duplex pump set shall be sized to provide full specified flow capacity from each pump. The pump set shall be provided with a separate high voltage Motor Controller panel and a low voltage 24vdc Logic Control panel installed on the skid package. The pump set shall be preassembled and tested by the manufacturer at their facility; job site assembly will not be

permitted. All piping shall be schedule 40, or heavier, black pipe suitable for use with fuel oil. Pipe fittings shall be malleable or steel fittings rated for 150 psi and suitable for use with fuel oil. Threaded connections are satisfactory on pipe sizes 1" NPT and smaller, 1.25" and larger piping connections shall be welded. On welded systems, where threaded connections are necessary by the design of individual components, a threaded nipple and welded flange shall be used. The pump set shall be finished with industrial enamel. All electrical conduits will be liquid tight or better.

B. Pumps shall be positive displacement type with cast iron housings. The pump shall be coupled to a TEFC motor with a flexible coupling. The motor and pump assembly shall be permanently aligned with a permanent alignment bracket or laser aligned and documented. The pumps shall be provided with self adjusting mechanical seals.

C. Provide a fully functioning, 24vdc, UL 508 listed motor control panel that is permanently mounted on fuel oil pump skid and integrated with the Motor Control Module. Enclosure shall be NEMA 4 rated. The control panel shall be preprogrammed and configured with nonproprietary PLC hardware. HMI touch-screen shall be provided.

D. Motor Controller Module shall be UL 508 listed shall be provided and permanently mounted on fuel oil pump skid. The panel enclosure shall be NEMA 4 with service disconnect for each fuel pump motor, Hand-Off-Auto pump selector switches, pump status and alarm lamps, terminal block for all skid and field wiring connections, control power transformer (if required), pump running hour totalizers and alarm bell.

E. Strainers shall be cast iron simplex type with a mesh basket. The strainer shall be rated for oil service at a minimum 150psi working pressure. No special tools shall be required for operation or maintenance. The strainer shall be selected by the pump set manufacture to meet the capacity of the pump set with a maximum, clean basket, pressure drop of 1"hg.

F. The pump base shall be designed and constructed to act as a containment basin with a minimum 3" continuously welded reservoir wall providing containment. Electrical motors and components shall be mounted above maximum liquid level of containment basin. To minimize trip hazards and equipment damage all pump set components shall be located within the perimeter of the containment basin walls no extrusions are allowed.

G. A float switch shall be provided to detect a flooded containment basin. The switch shall be normally closed, opening on a rise in liquid level of the containment basin. The float switch shall be compatible with fuel oil and be located within the perimeter of the containment basin.

H. A single paddle type flow switch shall be mounted on the common header.

I. An external relief valve shall be provided to relieve the full capacity of the associated pump. The relief valve shall be installed in the pump discharge piping prior to any isolation valves. The use of a pump internal relief valve is not permitted.

J. A class 150 bronze "Y" type swing check shall be installed in the discharge side of each pump. Check valves shall have a re-grindable bronze seat, accessible through a threaded cap. Ball type check valves are not acceptable.

K. Threaded valves shall be brass or stainless steel, full port ball valves. The valves shall be provided with blow-out proof stem and adjustable stem packing. Welded valves shall be carbon steel. Valve handles shall indicate valve position.

L. The gauges shall be provided with 4" dials, stainless steel cases and be suitable for industrial use. The gauges shall be glycerin filled and be manufactured to an accuracy of +/- 1% of full scale.

M. The Logic Control Module shall provide all logic to operate the pump set, monitor and control levels in up to 3 day tanks, and start, stop and rotate fuel pumps; monitor day tank level switches, monitor day tank temperature switch, monitor day tank leak detector, monitor day tank flooded vent switch, control and monitor up to 3 tank fill manifolds. Provide alarm output to fill manifold junction box or local control box.

N. The motor control module shall provide field wiring terminal and pilot devices for remote operation of the fuel pump set and monitoring of system safeties and components. Provide for local-manual operation of individual fuel pump or select auto for operation by control system, alarm upon input from logic control system. Provide flooded basin and strainer D/P alarm discreet signals to control system, alarm shall be energized upon switch opening. Provide individual positive pump flow discreet signal to control system.

O. Safety and environmental provisions shall include containment basin with 4" reservoir walls to prevent the release of fuel oil through minor drips, seal failure and strainer leakage; fail safe operation of flow switches and safety devices; leak detector switch for containment basin; OSHA approved coupling guard and alignment bracket.

P. Interface and communication shall be limited to analog and discreet outputs. These points shall include discreet outputs (dry contacts); Pump 1 flow proven, Pump 2 flow proven, Flooded Basin, High strainer DP. Analog outputs (4-20mA) shall include Pump system outlet pressure, Pump system inlet pressure. Discreet inputs shall include Pump 1 run, Pump 2 run, General alarm. Communications shall be determined by the control system provided by the automatic temperature control contractor.

Q. The fuel pump set shall be tested for tightness and proper operation prior to leaving factory. The pressure test for tightness shall be a "wet" test with fluorescent liquid; the system shall be brought to pressure and after 60 minutes, each joint shall be visually inspected under pressure with a fluorescent lamp. If any leaks are detected repairs must be made and the system shall be retested in its entirety. Simply testing the system with air pressure and soap bubbles is unacceptable. After a successful pressure test and documentation of those results each pump shall be energized, checked for proper rotation and operation. The motor full load amps shall be read and recorded. The manufacturer shall set all pressure relief and regulating valves, the settings shall be recorded on tags affixed to each individual device and noted in the installation/operation manual shipped provided to installing contractor. The testing liquid shall be purged. If fuel oil is used as the test media it must be removed sufficiently to prevent any accumulation that could result in spillage during transportation, unloading or installation. The Owner's representative may witness the testing. This factory acceptance test requirement is to be noted in the submittal approval. It is the responsibility of the Owner or his representative to coordinate his schedule with the manufacturer so as not to affect manufacturing or delivery schedules.

R. The wiring between the Logic Control Module, the Motor Control Module and individual pump set components shall be installed by the manufacturer, at his facility, to provide a single location for connection of field wiring. The wiring shall be done in accordance with NEC with special attention being paid to ensure conduits are not overfilled.

S. Equivalent manufacturers acceptable shall have at least 10 years experience designing and building fuel oil pump sets and shall have, on staff, degreed engineers to provide assistance to the installing contractors, owners and operators.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pumps as indicated on plans and in strict accordance with manufacturer's installation instructions.

END OF SECTION 22 3150

SECTION 22 5100 - PLUMBING FIXTURES

PART 1 - GENERAL (Reference Section 220500)

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND TRIM

A. Provide plumbing fixtures as shown on drawings and as specified complete including piping and connections. China fixtures shall be of best grade vitreous ware without pit holes or blemishes and outlines shall be generally true. Architect/Engineer reserves right to reject any piece which in his opinion is faulty. Fixtures fitting against walls shall have ground backs. Exposed piping and fittings shall be chrome plated.

B. Set fixtures true and level with all necessary supports for fixtures installed before plastering is done. Nipples through wall to fixture connections shall be chrome plated brass. Provide silicone sealer around perimeter of lavatories, water closets, and urinals at connection to wall and/or floor.

C. Equivalent fixtures and accessories by following manufacturers will be acceptable.

Fixtures: American Standard, Crane, Eljer, Bradley, Acorn.
Fittings and Supports: Josam, Smith, Wade, Zurn, Jonespec.
Seats: Church, Olsonite, Bemis or Beneke.
Drinking Fountains: Halsey Taylor, Elkay, Oasis, Haws.
Flush Valves: Sloan, Zurn, Delaney.
Lavatory & Sink Trim: American Standard, Eljer, Chicago, Sloan, Zurn.
Traps, Supplies and Stops: Dearborn, Brass Craft, Central D, Sanitary Dash or as specified under plumbing fixtures.

Supplies and Stops: Dearborn Fig. No. 2700 CW 1/2" compression screw driver stop and 3/8" O.D. risers in length required. Provide deep chrome plated brass escutcheons.

Traps: Dearborn #FS510 (1-1/2") and/or EFS507 (1-1/4") cast brass body with clean-out and 17 gauge tube outlet "P" trap. Provide deep chrome plated brass escutcheon with set screw.

D. All fixture shall be cleaned and free of all construction debris. Electric water cooler shall be protected during construction. Any chrome trim with wrench marks shall be removed and new trim installed. Architect/Engineer reserves the right to reject any plumbing fixture.

PART 3 - EXECUTION

3.1 PLUMBING FIXTURE SCHEDULE

A. Refer to plumbing fixture schedule on plans for specific requirements for plumbing fixtures.

END OF SECTION 22 5100

SECTION 22 6100 - PLUMBING EQUIPMENT

PART 1 - GENERAL (Reference Section 220500)

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

A. Drains shall be type and style listed below. Unless indicated otherwise provide each drain that does not have an integral "P" trap with a deep seal cast iron "P" trap in connecting piping.

1. Floor Drain Type 1: Wade #W-1100 floor drain, dura-coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable nickel bronze strainer. Strainer shall have a 6" round top and security screws. Floor drain type 1 indicated with Asterisk "*" on plans shall be provided with solid top and security screws.
2. Floor Drain Type 2: Wade #W-1240 8" round top medium duty drain, cast iron deep sump body with bottom outlet, seepage pan and combination membrane flashing clamp and frame for medium duty nickel bronze top and grate with secondary dome strainer less bucket. Provide 3/4 top to accept condensate drain where drain used for condensate drain receiver.

2.2 ROOF DRAINS

A. Roof Drains shall be type and style as listed below.

1. Roof Drain Type 1: Wade #W-3000 52 AE cast iron roof drain with flange, flashing ring with gravel stop and mushroom dome.
2. Roof Drain Type 2: Wade #W-3000 52 AE D same as type "1" except provide stand pipe drain for overflow drain application.

B. Equivalent drains by J.R. Smith, Zurn, or Josam.

2.3 CLEANOUTS

A. Provide cleanout the full size of soil pipe served up to 4" I.D. Cleanouts for soil lines larger than 4" shall be 4". Provide cleanouts in base of soil pipe stacks, ends of sewer main, at changes in direction of over 45 degrees and in horizontal pipe runs exceeding 100 feet at 50 foot intervals.

B. Install cleanouts so they are accessible by extending them through walls, floors, to outside of building or to above grade as required.

C. Where exterior cleanouts do not occur in sidewalks, paved roadways, etc., provide a concrete pad 18" x 18" x 6" thick with top 1-1/2" above finished grade. Isolate concrete pad from sanitary drain pipe riser.

D. Cleanouts shall be type and style as listed below

1. Floor: Wade #W-6000-XS cast iron cleanout with square, heavy duty, scoriated nickel bronze top, adjustable above to finished floor.
2. Wall: Wade #W-8450-C cleanout with dura-coated cast iron ferrule and cadmium plated cast iron counter-sunk plug complete with round smooth nickel bronze wall access cover and flush over-wall frame. Provide security screws.
3. Exterior: Wade #14-7000Z coast iron floor cleanout with adjustable housing. Ferrule with tapered brass plug and round heavy duty gray iron scoriated top. Cast housing into concrete pad. Ferrule spigot of outlet shall float inside of housing.

E. Equivalent by J.R. Smith, Wade, or Josam.

2.4 DOMESTIC HOT WATER EXPANSION TANKS

A. Provide welded steel diaphragm type tank, pre-charged to the minimum system operation pressure. Tank shall be ASME coded and suitable for domestic water service.

B. Domestic hot water expansion tanks shall be as indicated on plans.

2.5 DOMESTIC HOT WATER RECIRCULATING PUMPS

A. Provide all bronze horizontal domestic hot water recirculating pump. Pump motor shall be provided with internal thermal overload protection. Provide adjustable motor cradle, stainless steel shaft, enclosed brass impeller, brass acorn impeller nut, flexible bellows, seal, N. resistant seal with full “O” ring, thrust collar double bronze bearings, spring loaded oil closure. Bearings and thrust collar shall be submerged in oil, bracket shall be cast iron. Seal plate shall be brass. All wetted parts shall be non-corrosive. Equivalent by B&G, Armstrong, Aurora. Refer to schedule on plans.

2.6 WALL HYDRANTS

A. Wall hydrants shall be Wade 8600, 175 with connections for 3/4" pipe and hose. Non-freezing type with key and vacuum breaker. Provide bronze casing and nickel bronze box.

B. Equivalent by Smith, Zurn, Woodford or Josam.

2.7 HOSE BIBBS

A. Woodford model 21 wall faucet rough brass finish,steel wheel handle, adjustable packing unit with deep stem guard teflon impregnated packing and standard “O” size washer.

2.8 THERMOSTAT MIXING VALVES

A. Provide Leonard TM 28-E-RF thermostatic water mixing valve with solid bimetallic thermostatic element. Adjustable high limit temperature setting of 120□F. Provide color coded dial with locking regulator. Provide check stops, union on inlets, wall support, outlet volume control shut off. Rough bronze construction. 1.0 GPM minimum flow 15 GPM flow at maximum 20 psi system pressure drop. Provide all bronze circulator. Refer to plans for location.

B. Equivalent by Powers.

2.9 ELECTRIC DOMESTIC WATER HEATER

A. Provide commercial electrical water heater, where shown and as scheduled on the drawings. Provide T&P valve, foam tank insulation, and anode rods.

B. Water heater shall have a porcelainized glass lined tank, protected by extruded high-density anode rod. Drain valve shall be provided.

C. Water heaters shall be CSA certified and rated for a working pressure of 150 psi, a factory installed Temperature and Pressure Relief Valve shall be provided.

D. Water heater tanks shall be covered by a 3 year limited warranty.

E. Heating Elements shall be medium watt density with Zinc-Plated copper sheath on Incoloy sheath. Each element shall be controlled by an individually mounted thermostat and high temperature cutoff switch.

F. Outer jacket shall be steel with a baked enamel paint finish. A full-size control compartment shall be provided with hinged front cover.

G. Electrical junction box with heavy duty terminal block shall be provided.

H. Equivalent by A.O. Smith, State, Rheem.

END OF SECTION 22 6100

SECTION 22 7100 – BELOW GRADE FUEL STORAGE TANKS AND CONTAINMENT PIPING

PART 1 - GENERAL (Reference Section 220500)

PART 2 - PRODUCTS

2.1 BELOW GRADE FUEL STORAGE TANKS

A. Provide where shown on plans and as specified herein double wall fuel storage tanks with secondary containment.

B. The tank shall be fiberglass reinforced plastic (FRP) UL-listed underground storage tank as shown on the drawings. The tank size, fittings and accessories shall be as shown and scheduled on the drawings. The fiberglass tank shall be manufactured by Xerxes® Corporation.

C. The tank shall be tested and installed according to the Xerxes Installation Manual and Operating Guidelines for Fiberglass Underground Storage Tanks in effect at time of installation.

D. Warranty shall be manufacturer's standard limited warranty in effect at the time of purchase.

E. Below grade fuel storage tanks shall be tested and listed as follows:

1. Underwriters Laboratories (UL) Standard for Safety 1316 Glass-Fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures. A UL Label shall be attached to each tank.
2. National Fire Protection Association (NFPA) Standards: NFPA 30: Flammable and Combustible Liquids Code, NFPA 30A: Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 31: Standard for the Installation of Oil-Burning Equipment.
3. City of New York Department of Buildings M.E.A.
4. American Concrete Institute (ACI) standard ACI 318-11, Building Code Requirements for Structural Concrete.

F. The below grade tank shall meet the following design criteria:

1. Interstitial Pressure - The interstitial space of the tank shall withstand a minimum 20-psig pressure test.
2. Internal Load – Tank shall withstand a 5-psig air-pressure test with a 5:1 safety factor.
3. Surface Loads – Tank shall withstand surface H-20 and HS-20 axle loads when properly installed according to Xerxes' current Installation Manual and Operating Guidelines.
4. External Hydrostatic Pressure – Tank shall be designed for 7' of overburden over the top of the tank, the hole fully flooded and a safety factor of 5:1 against general buckling.

G. Product Storage

1. The primary containment of double -wall tanks shall be vented and operated at atmospheric pressure only.
2. Tank shall be capable of storing liquids with a specific gravity up to 1.1.
3. Tank shall be capable of storing products identified in the manufacturer’s standard limited warranty in effect at the time of purchase.

H. Materials of Construction

1. The primary and secondary walls of the tank shall be manufactured with 100% premium resin and glass-fiber reinforcement. No sand or silica fillers shall be added to the resin.
2. The interstitial space between the primary and secondary walls shall be constructed with a glass reinforcement material such as Parabeam®, which provides a structural bond between the two tank walls, while creating a defined interstice that allows for free flow of liquid.

2.2 TANK MONITORING SYSTEM

A. General

1. Tank shall be continuously monitored with TRUCHEK hydrostatic leak monitoring system.
2. The continuous monitoring system shall include monitoring fluid factory-installed in the interstitial space and within a fiberglass tank-top mounted reservoir.
3. The monitoring system shall be recognized by the National Work Group on Leak Detection Evaluations (NWGLDE) as continuous leak detection and as a precision tank test.
4. The monitoring system shall be independently tested by a qualified third-party and verified to be capable of detecting leaks as small as .05 per hour when proper tank tightness test procedures are followed.

B. Design

1. The continuous monitoring system shall be designed to detect a leak in either the primary or secondary wall at all times, regardless of the water table conditions at the installation site.
2. The interstice of the tank shall be designed for a 5:1 safety factor beyond normal hydrostatic operating pressure to ensure structural integrity and to prevent false leak alarms.

2.3 ACCESSORIES

A. Tank Anchoring

1. Anchor straps shall be as supplied by tank manufacturer and designed for a maximum load of 25,000 lbs.
2. Galvanized turnbuckles (two per anchor strap) shall be supplied by the tank manufacturer.

B. Manways

1. The standard manway shall be flanged, 22" I.D. and complete with UL-listed gaskets, bolts and covers as shown on tank drawings.

C. Threaded Fittings

1. All threaded fittings shall be NPT half or full couplings, in 2”, 4” or 6” diameters.
2. Fittings shall be installed on the tank-top centerline or in the cover of the manway as shown on the tank drawings.

D. Containment Collars & Sumps

1. The tank shall have factory installed 48”-diameter containment collars as shown on the tank drawings.
2. Containment sumps in 48” diameter, provided by the tank manufacturer and designed for mounting on the containment collars, shall be supplied as shown on the tank drawings.

3. UL-listed adhesive shall be provided by the tank manufacturer with each containment collar and sump.
4. Containment collars and sumps shall be UL-listed for use with the manufacturer's tank.
5. Containment collars and sumps shall be designed and supplied as a containment system. Only sumps provided by the manufacturer shall be allowed.

2.4 CONTAINMENT PIPING

A. Provide where indicated on plans, flexible fuel oil piping as manufactured by OPW or equal. Piping shall be specifically manufactured for fuel oil application and shall be tested under UL 971. Provide all required end fittings, pipe couplings and accessories for a complete and fully operational and functional system.
B. Containment piping shall be provided and sized as required to contain two product carrying lines. All required end fittings, sump entry fittings, mounting flanges and any other miscellaneous accessories shall be provided to result in a complete and fully functional system.

PART 3 – EXECUTION

3.1 TESTING

A. The tank shall be tested according to the Xerxes Installation Manual and Operating Guidelines in effect at time of installation.

3.2 INSTALLATION

A. The tank shall be installed according to the Xerxes Installation Manual and Operating Guidelines in effect at time of installation.

END OF SECTION 221455

SECTION 23 0500 - COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL PROVISIONS

1.1 CONTRACT DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications preceding this division of this specification are applicable to contractors, subcontractors, and material suppliers.

1.2 SPECIFICATION FORM AND DEFINITIONS

A. These Specifications are abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the contractor shall", "shall be", "as noted on the Drawings", "according to the drawings", "a", "an", "the" and "all" are intentional. Omitted words and phrases shall be supplied by inference.

B. The term “Engineer” wherever used in these specifications, shall mean LATIMER, SOMMERS & ASSOCIATES, P.A., 3639 SW SUMMERFIELD DRIVE, SUITE A, TOPEKA, KANSAS 66614, PHONE 785-233-3232, FAX 785-233-0647.

C. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with Owner to perform this work.

D. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires Engineer's review.

E. "Provide" means furnish and install.

F. Engineer hereinafter abbreviated “Eng” shall mean the Design Engineer.

G. Equipment and/or materials manufacturer hereinafter abbreviated E/M shall mean the manufacturer of equipment or materials specified or referred to.

H. When the term “equivalent” is used in context to products or manufacturer’s, the equivalency of the proposed product or manufacturer to be used in lieu of the specified product or manufacturer is the sole decision of the A/E.

1.3 QUALIFICATIONS

A. The contractor responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractor shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractor shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.4 LOCAL CONDITIONS

A. Visit site and determine existing local conditions affecting work in contract.

B. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.5 CONTRACT CHANGES

A. Changes or deviations from Contract, including those for extra or additional work must be submitted in writing for review of Engineer. No verbal orders will be recognized.

1.6 LOCATIONS AND INTERFERENCES

A. Location of equipment, piping and other mechanical work is indicated diagrammatically on the Drawings. Determine exact locations on job, subject to structural conditions, work of other sections of the Specifications, access requirements for installation and maintenance and approval of Engineer.

B. Study and become familiar with the Drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with work of other trades, and install work in such a way as to avoid interference with work of other trades. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed by Engineer prior to installation.

C. Any pipe, apparatus, appliance or other item interfering with proper placement of other work as indicated on Drawings, specified, or required, shall be removed and if so shown, relocated and reconnected without extra cost. Damage to new or existing work caused by Contractor shall be restored as specified for new work.

D. Do not scale Drawings for dimensions. Accurately lay-out work from dimensions indicated on Drawings unless such is found to be in error.

E. Report any conflict stated above to Engineer for coordination.

1.7 PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.

1. At the completion of construction, all piping systems must be cleaned and properly treated by appropriate chemical treatment contractor. Systems which are not determined acceptable to the A-E shall be re-cleaned.
2. All systems, whether used for temporary construction conditioning or not, shall have a 1 year warranty from the date of substantial completion, irregardless of start-up date.
3. Contractor shall make arrangements for all necessary power to operate equipment during construction and shall include in bid all costs for such use.

1.8 TEMPORARY UTILITIES

A. Contractor shall provide temporary utilities as indicated in Section 015000.

1.9 WARRANTY

A. All systems are to be warranted to Owner and Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from acceptance of systems by Owner.

B. Contractor warrants to Owner and Engineer that on receipt of notice from either of them within one year of warranty period following date of acceptance all defects that have appeared in materials and/or workmanship shall be promptly corrected to condition required by contract documents at contractor expense.

C. The warranty above expressed shall not supersede any separately stated warranty or requirements required by law or by these specifications.

1.10 ALTERNATES

A. Refer to General Requirements and description for alternate bid items.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for bidder to use its ingenuity and abilities to perform the work to its and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.

B. Material and equipment provided shall be first class quality, new, unused and without damage unless noted otherwise.

C. In general, these specifications identify required materials and equipment by naming first the manufacturer whose product was used as the basis for the project design and specifications. The manufacturer's product, series, model, catalog and/or identification numbers shall set quality and capacity requirements for comparing the equivalency of other manufacturer's products. Where other manufacturer’s names are listed they are considered an approved manufacturer for the product specified, however; the listing of their names implies no prior approval of any product they may propose to furnish as equivalent to the first named product unless specific model or catalog numbers are listed in these specifications or in subsequent addenda. Where other than first named products are used for base bid proposal it shall be the responsibility of the Contractor to determine prior to bid time that the proposed materials and equipment selections are products of approved manufacturers which meet or exceed the specifications and are acceptable to the Engineer.

D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Engineer for review prior to procurement.

E. Prior to receipt of bids, if the Contractor wishes to incorporate products other than those named in the specifications or drawings they shall submit a request for approval of equivalency in writing to the A/E no later than (10) ten calendar days prior to bid date. Engineer will review requests and acceptable items will be listed in an Addendum issued to principal bidders. Equivalents will ONLY be considered approved when listed by project addendum. Substitutions after this may be refused at Engineers option.

F. Materials and equipment proposed for substitution shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two (2) copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison. In proposing a substitution prior to receipt of bids, include in such proposal cost of altering other elements of project, including adjustments in mechanical/electrical service requirements necessary to accommodate such substitution.

G. In proposing a substitution prior to receipt of bids, include in such bid all costs of altering other elements of the project, including such items as adjustments in mechanical/electrical service requirements necessary to accommodate such substitutions. In addition, all physical space and weight requirements requiring additional structural support, modifications to the base floor plans, equipment concrete pad/roof curb dimensions shall be incorporated as required into such bid to accommodate such substitutions.

H. Within ten (10) working days after bids are received, apparent low bidder shall submit to A/E for approval three copies of a list of all major items of equipment he intends to provide. As soon as practicable and within ten (10) working days after award of contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work for Engineer's review. Where ten (10) working day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certifications that order was placed within ten (10) working day limit.

PART 3 - EXECUTION

3.1 SHOP DRAWINGS

A. Contractor shall furnish shop drawings of all materials and equipment. Submittals shall be submitted electronically. In addition, a minimum of (3) paper copies of any submittal that contains informational drawings or documentation that is in a format larger than 8-1/2 x 11shall be submitted to the A/E. A/E will return the submittals to the Contractor electronically except that a copy of large format submittals will be returned to the contractor via mail. A copy of fully processed product data submittal shall be included as a part of each operating and maintenance manual.

B. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc., that are to be provided. Mark each submitted item with applicable section and paragraph numbers of these specifications, or Drawing sheet number when item does not appear in specifications. Where equipment submitted does not appear in specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization. Each catalog sheet shall bear Equipment Manufacturer’s name and address. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor shall be required to submit all applicable equipment/material assembly mock-ups as required by the Contract Documents for Engineer approval. Contractor shall provide changes and resubmit mock-ups until Engineer is satisfied final product meets or exceeds stated specifications and quality of specified product.

D. Contractor shall check all shop drawings to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Engineer for their review.

E. All shop drawings submitted to Engineer shall bear Contractor's approval stamp which shall indicate that Contractor has reviewed submittals and that they meet specification and drawing requirements. Contractor’s submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed, electrical characteristics, provisions for supply, return and drainage connections to building systems. All shop drawings not meeting Contractor's approval shall be returned to its supplier for resubmittal.

F. No shop drawing submittals will be considered for review by the Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of Contractor's review. All comments or minor notations on shop drawings shall be flagged to indicate originator of comment.

G. Engineer will not be responsible for or the cost of returning shop drawing submittals that are submitted without Contractor's review and approval stamp. A letter will be sent to Contractor by the Engineer indicating receipt of an improper submittal for pick-up by Contractor or supplier for 15 working days after date of receipt. If not picked up by the 16th working day, submittals not bearing Contractor's review and approval stamp will be disposed of by Engineer.

H. Engineer's review of shop drawings will not relieve Contractor of responsibility for deviations from drawings and specifications unless such deviations have been specifically approved in writing by Owner or its representative, nor shall it relieve Contractor of responsibility for errors in shop drawings. No work shall be fabricated until Engineer's review has been obtained with "no exceptions" or "as noted" language. Any time delay caused by correcting and resubmitting shop drawings will be Contractor's responsibility.

I. The preparation of coordination drawings are not a requirement of the project unless otherwise indicated on the drawings. It is strongly recommended, however, that the various contractors work together to prepare detailed coordination drawings in an effort to minimize conflicts created as the various trades install their particular portion of the work. The design team will assist the contractor in resolving coordination conflicts by reviewing these coordination drawings; however, this review will not constitute any approval of said drawings. There will be no additional compensation for deviations in pipe, ductwork or conduit routing required to achieve coordination of the material and equipment scheduled or indicated to be installed as a part of the project. There will be no additional compensation for the rework of pipe ductwork or conduit should this become required as a result of a lack of coordination between the various trades..

J. Contractor shall submit the following items for this project:

1. All piping, fittings, unions etc. for the following systems:
    a. High Pressure Steam
    b. Low Pressure Steam
    c. Pumped Condensate Return
    d. Gravity Condensate Return
    e. Heating Hot Water
    f. Cooling Chilled Water
    g. Condensate Drain
    h. Condenser Water
    i. Natural Gas
    j. Fuel Oil
2. All valves
3. Steam Specialties including but not limited to:
    a. Pressure Reducing Valves
    b. Steam Traps
    c. Relief Valves
    d. Expansion compensators
    e. Ball Joints
4. Piping insulation
5. Piping Supports, guides, hangers and structural attachments and assemblies
6. Pumps and Pump specialties
7. Steam Heat Exchangers
8. Condensate return Units
9. Ductwork and ductwork accessories
10. Grilles Registers and Diffusers
11. Ductwork Insulation
12. Air Handling Units

13. Fan Coil Units
14. Exhaust Fans.
15. Cooling Towers
16. Boilers
17. Surge Tanks
18. De aerator Tanks
19. Blow Down Coolers
20. Chemical Treatment Systems
21. Automatic Temperature Controls
22. System Testing and Balancing

3.2 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

A. Submit an outline copy of installation, operating, and maintenance manuals for review and comment.

B. Submit three copies of installation, operating, maintenance instructions, and parts lists for equipment provided. After receiving comments from outline review. Instructions shall be prepared by equipment manufacturer.

C. Keep in safe place, keys and wrenches furnished with equipment under the Contract. Present to Owner and obtain receipt for same upon completion of project.

D. Prepare a complete notebook, covering systems and equipment provided and installed under this contract. Submit notebooks to Engineer for review before delivery to Owner. Contractor at his option may prepare this notebook, or retain an individual to prepare it for him. Contractor shall include cost of this service in bid. Notebook shall contain following:

1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined under this specification.
2. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
3. A complete set of approved final shop drawings.
4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of the systems installed.
5. As-Built Drawings: The Contractor shall mark up a set of contract documents during construction noting all changes and deviations including change orders. These will be delivered to A/E at end of the project for review and correction as required. After the originals are changed to reflect the blue line set, a complete set of reproducible set of project record drawings drawn at the original scale indicated shall be included in the brochure.
6. All required warranties and guarantees, including start and end date of warranties/guarantees.

E. Provide notebooks bound in black vinyl three-ring binders. Reinforce binding edge of each sheet of looseleaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:

1. Project name and address.
2. Section of work covered by brochure, e.g. "Heating, Ventilating and Air Conditioning", and "Plumbing", etc.

F. In addition to the hard copy of the operating and maintenance manuals, provide a digital copy delivered to the Owner on a flash drive, CD or DVD.

3.3 CUTTING AND PATCHING

A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Cut no structural members without Engineer's approval and in an approved manner.

B. Patching shall be by mechanics of particular trade involved and shall meet approval of Engineer.

C. Drilling and cutting of openings through building materials requires Engineer's review and approval. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work is not acceptable.

3.4 MUTILATION

A. Mutilation of building finishes or existing/new equipment, caused by demolition or installation of new work shall be repaired at Contractor's expense to approval of Engineer.

3.5 WALL PENETRATIONS

A. Include the installation of all boxes, access panels and sleeves for openings required to install the work. All floor and wall penetrations shall be sealed to meet fire rating requirements using materials tested in accordance with ASTM E814.

3.6 OPENINGS, ACCESS PANELS & SLEEVES

A. Include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls unless otherwise noted on plans. Set and verify the location of sleeves as shown on structural plans that pass through beams, only if so shown. All floor and wall penetrations be sealed to meet fire rating requirements. Access panels shall include those required to access fire dampers, valves, smoke dampers, pipe chases, manual and automatic dampers, etc. Locations and sizes of panels are to be determined by the contractor and are not specifically shown on the drawings.

3.7 FIRE STOPPING

A. All holes or voids created by the mechanical Subcontractor to extend pipe through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall be ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, putty, strip and sheet forms. Equivalent by Hilti, SpecSeal.

B. Submit for review fire-stopping methods and sleeve drawings indicating all required application, methods and sleeves. Refer to Engineering drawing for locations of fire rated partitions and floors.

C. Penetrations through all walls and/or floors shall be firestopped.

3.8 SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set all equipment level on adequate supports and provide proper anchor bolts and isolation as shown or specified. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.

B. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best recognized practice. Contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required. Contractor

shall verify that structural members of building are adequate to support equipment. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Engineer for review before proceeding with fabrication or installation.

3.9 START-UP, CHANGEOVER, TRAINING AND OPERATION CHECK

A. Contractor shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.

B. All owner training sessions shall be orderly and well organized and shall be professionally videotaped using digital format. Contractor shall produce a DVD of each training session which shall be submitted to Owner as part of the Operation and Maintenance Manual submittal.

3.10 PRE-FINAL AND FINAL CONSTRUCTION REVIEW

A. At Contractor’s request, Engineer will make pre-final construction review to determine if to the best of its knowledge project is completed in accordance with Contract Documents.

B. Items found by Engineer as not complete or not in accordance with requirements of contract will be outlined in report to Engineer for forwarding to subcontractors. Subcontractor shall complete and/or correct these items, before notifying Engineer it is ready for final review.

C. All necessary system adjustments, including air systems balancing, shall be completed and all specified records and reports submitted in sufficient time to be received by Engineer at least ten working days prior to date of final construction review.

D. At final construction review, Contractors shall be present or shall be represented by a person of authority. Each shall demonstrate, as directed by Engineer that work complies with purpose and intent of contract documents and shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 23 0500

SECTION 23 0501 - EXTENT OF CONTRACT WORK AND CODES

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL EXTENT OF WORK INCLUDED IN CONTRACT

A. Provide mechanical systems indicated on Drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of mechanical systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.

B. Become familiar with equipment provided by other Subcontractors which require mechanical connections and controls.

C. Electrical work required to install and control mechanical equipment which is not indicated on Drawings or specified under Division 16 shall be included.

D. The cost and provision of larger wiring, conduit, control, and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be provided at no increase in contract price.

E. Provide supervision to subcontractor to insure that required connections, interlocking and interconnection of mechanical and electrical equipment are made to attain intended control sequences and system operation.

F. Furnish electrical wiring diagrams to Engineer and to Electrical Subcontractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Subcontractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.

G. Obtain complete electrical data on mechanical shop drawings and list this data on an approved form which shall be presented monthly or on request, to Electrical Subcontractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of mechanical equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Subcontractor to order electrical equipment.

1.2 CODES, ORDINANCES, RULES AND REGULATIONS

A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal Governments, and other authorities having lawful jurisdiction.

B. Conform to latest editions and supplements of following codes, standards or recommended practices.

1. International Plumbing Code-2012.
2. International Mechanical Code-2012
3. International Building Code-2012.
4. National Electrical Safety Code Handbook H30- National Bureau of Standard.
5. Occupational Safety and Health Standard (OSHA) - Department of Labor.
6. NFPA No. 70 National Electrical Code-2008
7. NFPA No. 90A Air Conditioning and Ventilating Systems
8. NFPA No. 91 Blower & Exhaust System
9. International Fire Code – 2012
10. NFPA 72 – National Fire Alarm Code 2007
11. NFPA 110 – Emergency & Standby Power 2005

MISCELLANEOUS CODES:
ANSI A117.1 - Handicapped Accessibility
Americans with Disabilities Act (ADA)
Kansas State Boiler Code

C. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Engineer in writing before proceeding with work so that necessary changes can be made. However, if Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

D. Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Engineer with request for final review.

PART 2 - PRODUCTS

2.1 DRAWINGS

A. Drawings are to be considered diagrammatic for all systems. Piping and drawings do not show all required offsets and fittings. Contractor shall include in bid costs to provide systems which will avoid and coordinate will all existing conditions and all other building trades and systems.

END OF SECTION 23 0501

SECTION 23 0525 - SEISMIC PROTECTION

PART 1 - GENERAL

1.1 GENERAL

Note: The requirements for seismic protection measures to be applied to mechanical/electrical equipment and systems specified herein are in addition to any other items called for in other sections of these specifications.

A. Seismic protection for mechanical equipment and components shall be provided by the Mechanical Contractor.

B. Seismic protection for electrical equipment and components shall be provided by the Electrical Contractor.

C. Seismic protection for general construction items, including suspended ceilings, shall be provided by the General Contractor.

D. Refer to Section 22 0525.

1.2 MECHANICAL/ELECTRICAL EQUIPMENT

A. Mechanical/electrical equipment shall include the following items to the extent required on plans or in other sections of these specifications:

Boilers
Expansion Tanks
Water Chiller Units
Control Panels
Pumps with Motors
Light Fixtures
Motor Control Centers
Switchboards (Floor Mounted)
Suspended Ceiling Assemblies
Water and Gas Piping Drain, Waste and Vent Piping
Air and Refrigerant Compressors
Air Handling Units
Switchgear
Transformers
Ducts

1.3 MECHANICAL SYSTEMS

A. Mechanical systems shall include the following items to the extent required on plans or in other sections of these specifications:

Hot Water Distribution Systems
Chilled Water Distribution Systems
Gas Distribution Systems
Water Supply Systems
Sanitary Sewer Systems
Fire Sprinkler Systems

1.4 ZONE

A. This facility is located in Seismic Zone No. 2A.

1.5 EXCLUSION

A. Piping and ducts that do not require special seismic restraints: Seismic restraints may be omitted from the following installations:

1. Gas piping less than 1-inch inside diameter.
2. Piping in boiler and mechanical equipment rooms less than 1-1/4 inches inside diameter.
3. All other piping less than 2-1/2 inches inside diameter.

4. All electrical conduit less than 2-1/2 inches inside diameter.
5. All rectangular air handling ducts less than 6 square feet in cross sectional area.
6. All round air handling ducts less than 28 inches in diameter.
7. All piping suspended by individual hangers 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
8. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of the support for the hanger.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing Manufacturer's figure number, size, location, and features for each required pipe hanger and support.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly or components.

C. Maintenance Data: Submit maintenance data and parts lists for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

D. Shop drawings, along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed below shall be submitted in accordance with the SPECIAL CLAUSES. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

Sway Braces
Flexible Couplings or Joints
Resilient Type Vibration Devices
Smoke Stacks

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT SHALL CONFORM TO THE RESPECTIVE SPECIFICATIONS AND OTHER REQUIREMENTS SPECIFIED BELOW:

2.2 BOLTS AND NUTS

A. Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and B18.2.2, and ASTM A 307 or A 576.

B. Bolts, underground, ASTM A 325.

2.3 SWAY BRACE

A. Material used for members listed in Appendix of this specification, except for pipes, shall be structural steel conforming with ASTM A 36. Steel pipes shall conform to ASTM A 501.

2.4 FLEXIBLE COUPLINGS

A. Flexible couplings shall have same pressure ratings as adjoining pipe.

B. Flexible ball joints conforming to the following requirements may be employed on aboveground piping. Joints shall have cast or wrought steel casing and ball parts capable of 360-degree rotation plus not less than 15-degree angular movement. Joints shall be certified to be suitable for the service intended by the manufacturer, based on not less than 2 years' satisfactory operation in a similar application.

C. Flexible couplings and joints of the mechanical joint type may be used for aboveground or underground piping.

D. Mechanical couplings for steel or cast iron pipe shall be of the sleeve type and shall provide a tight flexible joint under all reasonable conditions, such as pipe movement caused by expansion, contraction, slight settling or shifting of the ground, minor variations in trench gradients, and traffic vibrations. Where permitted in other sections of these specifications, joints utilizing split-half couplings with grooved or shouldered pipe ends may be used.

E. Sleeve-type couplings shall be used for joining plain-end pipe sections. The coupling shall consist of one steel middle ring, two steel followers, two gaskets, and necessary steel bolts and nuts to compress the gaskets. Underground bolts shall be high-strength type as specified above.

F. Guy Wires: Guy wires shall conform to Fed. Spec. RR-W-410 as follows:

5/32 inch diameter	Type V, Class 1
3/16 inch to 5/16 diameter	Type V, Class 2
1/4 inch to 5/8 diameter	Type I, Class 2

PART 3 – EXECUTION

3.1 SWAY BRACES

A. Sway braces shall be installed on piping and duct to preclude damage during seismic activity. All bracing shall conform to the arrangements shown. Provisions of this paragraph apply to all piping within a 5-foot line around outside of building unless buried in the ground. Piping grouped for support on trapeze-type hangers shall be braced at the same intervals as determined by the smallest diameter pipe of the group. No trapeze-type hanger shall be secured with less than two ½-inch bolts. Bracing rigidity attached to pipe flanges, or similar, shall not be used where it would interfere with thermal expansion of piping.

3.2 SWAY BRACES FOR PIPING

A. Transverse Sway Bracing: Transverse sway bracing shall be provided at intervals not to exceed those given in Appendix of this section except for cast iron soil pipe, which shall be braced at not more than 10-foot intervals.

B. Longitudinal Sway Bracing: Longitudinal sway bracing shall be provided at 40-foot intervals.

C. Vertical Runs: Vertical runs of piping shall be braced at not more than 10-foot vertical intervals. For small tubing, bracing shall be provided at no more than 4-foot spacing.

D. Anchor Rods, Angles, and Bars: Anchor rods, angles and bars shall be bolted to either pipe clamps or pipe flanges at one end and cast-in-place concrete or masonry insert or clip angles bolted to the steel structure on the other end. Rods shall be solid metal or pipe as specified below. Anchor rods, angles, and bars shall not exceed lengths given in Appendix of this section.

E. Clamps on uninsulated pipes shall be applied directly to pipe. Insulated piping shall have clamps applied over insulation vapor barrier with high-density inserts and metal protection shields under each clamp.

F. Bolts: Bolts used for attachment of anchors to pipe and structure shall be not less than ½-inch diameter.

3.3 SWAY BRACES FOR DUCTS

A. Transverse Sway Bracing: Transverse sway bracing shall be provided at each horizontal turn of 45 degrees or more, at the end of each duct run, and otherwise at each 30-foot interval. Walls which ducts penetrate may be considered transverse braces.

B. Longitudinal Sway Bracing: Longitudinal sway bracing shall be provided at 60-foot intervals. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it, if the bracing is installed within 4 feet of the intersection, and it is sized for the larger duct.

C. Bracing Angles: Bracing angles for rectangular ducts shall be in accordance with Appendix of this section.

3.4 SPREADERS

A. Spreaders shall be provided between racked or adjacent piping runs to prevent contact during seismic activity whenever pipe or insulated pipe surfaces are less than 4 inches apart or four times the maximum displacement due to seismic force. Spreaders to be applied at same interval as sway braces. Spreaders shall be applied to surface of bare or insulated hot pipe and over insulation utilizing high-density inserts and pipe protection shields where vapor-barrier-type insulation is employed.

3.5 FLEXIBLE COUPLINGS OR JOINTS

A. Building Piping: Flexible couplings or joints in building piping shall be provided at bottom of all pipe risers larger than 3-1/2 inches in diameter, except thermal heat distribution piping.

B. Cast iron waste and vent piping need only comply with these provisions when caulked joints are used. Flexible bell and spigot pipe joints using rubber gaskets or no-hub fittings may be used at each branch adjacent to tees and elbows for underground waste piping inside of building to comply with these requirements.

C. Underground Piping: All underground piping and 4-inch or larger conduit, except thermal heat distribution system, shall have flexible couplings installed adjacent to building as shown. Additional flexible couplings shall be provided as follows:

1. On each side of the joints of demarkation between soils having widely differing degrees of consolidation.
2. At all points that can be constructed to act as anchors.
3. On every branch of a tee and each side of an elbow.

3.6 ANCHOR BOLTS

A. All floor or pad mounted equipment required by any Section of these specifications shall be rigidly fastened to the floor or pad by use of cast-in-place anchor bolts. Anchor bolts must conform to ASTM A 307. Anchor bolts shall have an embedded straight length equal to or at least 12 times nominal diameter of the bolt. If the size and number of the anchor bolts are not shown on the drawings then anchor bolts shall be ½" in diameter or the manufacturer's installation recommendations, whichever is the most stringent.

B. Four bolts per item shall be provided with a minimum embedment of 12 bolts diameters, a minimum bolt spacing of 16 bolts diameters and a minimum edge distance of 12 bolts diameters. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths.

C. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table.

3.7 RESILIENT VIBRATION ISOLATION DEVICES

A. Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure as in paragraph ANCHOR BOLTS except that an equipment weight equal to five times the actual equipment weight shall be used.

1. Resilient and Spring-Type Vibration Devices: Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 0.5 inches.

3.8 EQUIPMENT SWAY BRACING

A. Equipment sway bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes arranged as shown and secured at both ends with not less than ½-inch bolts. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45 degrees directed up and radially away from equipment and oriented symmetrically in 90 degree intervals on the horizontal plane, bisecting the angles of each corner of the equipment, provided that supporting members are properly sized to support operating weight of equipment when hangers are inclined at a 45 degree angle.

3.9 LIGHTING FIXTURES IN BUILDINGS

A. In addition to the requirements of the preceding paragraphs, lighting fixtures and supports will conform to the following:

B. Materials and Construction:

1. Fixture supports shall be malleable iron.
2. Loop and hook or swivel hanger assemblies for pendant fixtures shall be fitted with a restraining device to hold the stem in the support position during earthquake motions. Pendant-supported fluorescent fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.
3. Recessed fluorescent individual or continuous-row fixtures shall be supported by a seismic-resistant suspended ceiling support system and shall be provided with fixture support wires attached to the building structural members using two wires for individual fixtures and one wire per unit of continuous row fixtures.
4. A supporting assembly that is intended to be mounted on an outlet box shall be designed to accommodate mounting features on 4-inch boxes, 3-inch plaster rings, and fixture studs.
5. Surface-mounted fluorescent individual or continuous-row fixtures shall be attached to a seismic-resistant ceiling support system. Fixture support devices for attaching to suspended ceilings shall be a locking-type scissor clamp or a full loop band that will securely attach to the ceiling support. Fixtures attached to underside of a structural slab shall be properly anchored to the slab at each corner of the fixture.
6. Each wall-mounted emergency light unit shall be secured in a manner to hold the unit in place during a seismic disturbance.

C. Tests: In lieu of the requirements for equipment supports, lighting fixtures and the complete fixture-supporting assembly may be tested as specified hereinafter. Such tests shall be conducted by an approved and independent testing laboratory, and the results of such tests shall specifically state whether or not the lighting fixture supports satisfy the requirements given herein.

1. Test Equipment: To simulate earthquake motion, fixtures and supports shall be attached to a carriage suspended on rollers from an overhead track. A gear motor and crank assembly shall be used to provide oscillatory motion of approximately one cycle per second. The exact number of cycles per second and the actual dimensions of the crank apparatus shall be adjusted to produce a minimum carriage acceleration of 0.14g. The actual fixture-mounting surface shall be on the underside of the carriage and shall provide capacity for orienting the fixture in a horizontal plane in various positions, ranging from parallel to perpendicular to the line of traverse.
2. Test Requirements: All tests shall be conducted with the maximum fixture weight so as to produce the most severe loading conditions. Fixtures having stems shall be tested with the actual stem lengths to be used. Tests shall be of 1-minute duration with the mounting surface in the line of traverse, at 45 degrees to the line of traverse, and at 90 degrees to the line of traverse. A total of two fixtures shall be tested in each of the above positions. After each of the six tests, the complete stem assemblies from fixtures having stem assemblies shall be subjected to a tensile strength test. The sample shall withstand, without failure, a force of not less than four times the weight it is intended to support.
3. Acceptance: No component of a fixture nor its support shall be accepted individually. For acceptance, the fixture and its supports shall exhibit no undue damage, and no component of the fixture shall fail or fall from the fixture during testing.

D. Design Criteria: In lieu of the above test requirements, lighting fixtures shall be designed to resist a lateral force of 56 percent of the fixture weight.

E. Lighting Fixtures and Air Diffuser Supports: Lighting fixture and air diffuser supports shall be designed and installed to meet the requirements of equipment supports in the preceding paragraphs of this specification with the following exceptions:

1. Recessed lighting fixtures not over 56 pounds in weight and suspended and pendent-hung fixtures not over 20 pounds in weight may be supported and attached directly to the ceiling system runners by a positive attachment such as screws or bolts.
2. Air diffusers that weigh not more than 20 pounds and that receive no tributary loading from ductwork may be positively attached to and supported by the ceiling runners.

3.10 SMOKE STACKS

A. Stack shall be mounted directly on boilers or heat producing appliances or on floor supporting such devices with side inlets to stacks. All stacks must be supported with steel guys attached to a point three-fourths of the stack height external to the building. Guy wires shall be 1/4" 6 x 19 cable, improved plow steel with fiber core, as noted, with galvanized coating.

3.11 MISCELLANEOUS EQUIPMENT

A. The following specific items of equipment to be furnished under this contract shall be constructed and assembled so as to be capable of withstanding the horizontal equivalent static force of 0.11 times the operating weight of the equipment, at vertical center of gravity of the equipment without causing permanent deformation, dislocations, separation of components, or other damage, which would render the equipment inoperative for significant periods of time following an earthquake.

3.12 MISCELLANEOUS EQUIPMENT

Boilers
Cooling Tower
Air-Handling Units
Transformers
Switchboards and Switchgears
Motor Control Centers
Free Standing Electric Motors

3.13 APPENDIX

A. The following are reproductions from SMACNA Seismic Restraint Manual Chapters 4, 7 and 8 and contain details for duct, pipe conduit and equipment seismic restraint and shall be used for determining the required restraint for this project. The building shall be categorized seismic hazard level "C".

END OF SECTION 23 0525

SECTION 23 0550 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIRED WORK

A. Provide the reasonable identification of HVAC piping as specified below.

PART 2 - PRODUCTS

2.1 PIPING IDENTIFICATION

A. Identify piping for all new HVAC piping including chilled water, high pressure steam, low pressure steam, pumped or gravity flow steam condensate return, drain lines, etc. at intervals indicated below. Provide color coded stencil markings for each type of pipe utilized and provide flow direction arrows. Provide standard stencils, prepared with letter sizes conforming to recommendations of ASME A13.1. Stencil paint shall be exterior use, oil-based, alkyd gloss enamel in colors according to ASME A13.1. Paint may be in pressurized spray-can form.

B. All letter stenciling shall be minimum 1-1/4" high. Colors and wording shall be as directed by the Owner, using standard colors and standard abbreviations of all services being identified. Contractor shall submit for approval list of colors and wording prior to purchase of pipe marking equipment/material/installation. Pipe markers shall meet applicable ANSI Standard and OSHA requirements.

Piping Section	Pipe Identification Spacing (max spacing)
Within tunnel system	20'-0" on center
Within any building	8'-0" on center
in any mechanical Room of any building	8'-0" on center
Concealed above ceiling Within a building	10'-0" on center and within 3'-0" of a change in direction

2.2 VALVE IDENTIFICATION

A. Mark all valves with Seaton No. 300-BL brass identification tags with system legend, valve number and size stamped on tag. Lettering shall be black 1/2" high. Tags shall be minimum 2" in diameter and attached to valve with Seaton No. 16 brass jack chain. Contractor shall submit for approval list of identification markings and letterings prior to ordering tag material.

B. Prepare typewritten list of valve tags. List shall be typed in upper case and contain tag number, valve size, type, function and location. Provide copy of list, electronically, to Engineer prior to ordering tag material. Provide (1) copy of final list for mounting in location as directed by Owner. Submit a copy of list with each Operation and Maintenance Manual.

C. Provide valve identification on all ball, gate, globe or butterfly style shut-off or control valves 1 ½" or larger. Check valves do not need identification tags. Provide valve identification on any pressure reducing valve or pressure relief valve.

END OF SECTION 23 0550

SECTION 23 0600 – EXISTING EQUIPMENT TO BE RELOCATED

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL EXTENT OF WORK

A. It is the intent of this section of the specifications to identify existing equipment that is available for relocation and reuse in this current project.

B. An attempt has been made to identify all equipment in the Docking State Office Building (DSOB) that is available for reuse in the new State of Kansas – Energy and Service Center (KEC). If a bidding contractor locates or is aware of equipment in the DSOB that could be used in the new KEC, the Engineer shall be so informed in adequate time prior to the bid to allow for review and issuance in an addendum issued to bidding parties.

C. Where a particular piece of equipment is in a location that requires it to be disassembled in order for it to be removed and relocated and then reassembled in the new location, factory authorized technicians shall be engaged as required to complete the disassembly and the reassembly and to then certify that the reassembled equipment is in condition equal to that found prior to disassembly.

D. If any part or appurtenance is damaged during the disassembly, relocation, and / or reassembly, the part or appurtenance shall be replaced with factory certified new replacement parts.

1.2 SCHEDULE OF EXISTING EQUIPMENT AVAILABLE FOR REUSE

A. The following schedule identifies existing equipment that is available for reuse in the new State of Kansas – Energy and Service Center.

EXISTING MECHANICAL EQUIPMENT			
DESCRIPTION	**CURRENT LOCATION**	**NEW LOCATION**	**REMARKS**
WATER COOLED, HEAT RECOVERY CHILLER WCC-1	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	BOTH CHILLER AND ASSOCIATED ADAPTIVE CONTROL UNIT SHALL BE RELOCATED.
WATER COOLED, HEAT RECOVERY CHILLER WCC-2	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	BOTH CHILLER AND ASSOCIATED ADAPTIVE CONTROL UNIT SHALL BE RELOCATED.
WATER COOLED, CHILLER WCC-3	EISENHOWER STATE OFFICE BUILDING BASEMENT MECHANICAL ROOM	KANSAS ENERGY CENTER, ROOM 127	BOTH CHILLER AND ASSOCIATED ADAPTIVE CONTROL UNIT SHALL BE RELOCATED.
CHILLED WATER PRIMARY PUMP, 60 HP 460 VAC 3 PHASE	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	BOTH PUMP AND ASSOCIATED VARIABLE SPEED MOTER CONTROLLER SHALL BE RELOCATED.

EXISTING MECHANICAL EQUIPMENT CONTINUED			
CHILLED WATER PRIMARY PUMP, 60 HP 460 VAC 3 PHASE	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	BOTH PUMP AND ASSOCIATED VARIABLE SPEED MOTER CONTROLLER SHALL BE RELOCATED.
CHILLED WATER PRIMARY PUMP, 60 HP 460 VAC 3 PHASE	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	BOTH PUMP AND ASSOCIATED VARIABLE SPEED MOTER CONTROLLER SHALL BE RELOCATED.
CHILLED WATER SYSTEM EXPANSION TANKS	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	
CHILLED WATER SYSTEM AIR SEPARATOR	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	
CHILLED WATER SYSTEM MAKE UP WATER ASSEMBLY AND METER	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	
REFRIGERATOR ROOM EMERGENCY EXHAUST FAN RRVF-1	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	

END OF SECTION 23 0600

SECTION 23 1100 – CHILLED WATER, HOT WATER, GAS, STEAM & STEAM CONDENSATE PIPING

PART 1 - GENERAL (Reference Section 230500)

PART 2 - PRODUCTS

2.1 PIPING MATERIALS AND FITTINGS

A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. All materials listed may not be required on this project. See piping material schedule on the plans for materials to be used for each piping system. Piping materials shall be as follows:

B. Carbon Steel Pipe (1/8" thru 2"):

1. Provide seamless carbon steel conforming to ASTM specification A-106.
2. Pipe joints shall be threaded conforming to ANSI Standard B2.1.
3. Pipe by Armco, Jones, Laughlin Steel Corp., Youngstown Sheet and Tube Co., or United States Steel.

C. Carbon Steel Pipe (2-1/2" and above):

1. Provide electric resistance welded carbon steel pipe conforming to ASTM Specification A-53.
2. Pipe ends shall be beveled for welding.
3. Pipe by Armco, Jones and Laughlin Steel Corp., Youngstown Sheet and Tube Co., or United States Steel.

D. Polyvinyl Chloride Condenser Water:

1. Provide Schedule 80 polyvinyl chloride condenser water pipe conforming to ASTM D 1785. Joints shall be be equivalent to the piping system and shall be properly cleaned, primed and glued.
2. Pipe by Charlotte, Genova, Crest or equal.

E. Copper Pipe:
1. Refer to section 221213 for requirements for Copper Tube.

2.2 PIPING FITTINGS

A. Piping fitting used throughout project shall be proper type for installation method used and shall be compatible with piping system material. Fittings listed in piping material schedule shall conform to the following specifications:

B. Carbon Steel Welding Fittings:

1. Provide carbon low alloy seamless steel welding fittings conforming to current ANSI Standard B16.9 and ASTM Specification A234.
2. Fittings by Grinnell, Midwest or Tube Turn.

C. Branch Connection Welding Fittings:

1. Provide carbon steel weldolet fittings conforming to ANSI Standards B16.9, B16.11, B31.1.0 and ASTM specification A105, Grade 11.
2. Fittings by Bonney Forge.

D. Branch Connection, Welding to Screwed Fitting:

1. Provide carbon steel threadolet fitting conforming to ANSI Standards B16.9, B16.11, B31.1, and ASTM Specification A105, Grade 11.
2. Fittings by Bonney Forge.

E. Carbon Steel Flanges:

1. Provide carbon steel flanges conforming to ASTM Specification A181, Grade 1, and ANSI Standard B16.5.
2. Use only weld neck flanges unless allowed in writing by engineer to use slip on flanges.
3. Flanges by Babcock and Wilcox, Grinnell, Midwest or Tube Turn.

2.3 INSULATING UNIONS AND FLANGES

A. Provide insulating unions and flanges conforming to following specifications and plainly and permanently marked with manufacturers name and pressure class rating. Unions and flanges shall be as follows:

1. Steel pipe to steel pipe screwed end:

a. Provide Stockham malleable iron No. 693-1/2 insulating union with high dielectric strength insulating sleeve and gasket.

2. Steel pipe to steel pipe flanged end:

a. Provide two weld neck flanges of proper pressure rating insulated on both sides with Central or Klingerit Flange Insulation Kit.

5. Iron or steel pipe to copper pipe:

a. Provide Epco Dielectric union or flange with screwed or solder joint as required. Union shall have 250 PSI rating and flange 175 PSI rating at 190 degrees F.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Piping systems materials and installation shall conform with the following standards and codes.

System:	Heating and Air Conditioning Piping
Code:	ANSI Standard B31.1.0 "Power Piping"
	International Mechanical Code – 2006
	Kansas State Boiler Code

B. Pipe sizes indicated on plans and as specified refer o nominal size in inches for steel pipe, unless otherwise indicated. Pipes are sized to nearest 1/2". In no case shall piping smaller than size specified be used.

C. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.

D. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.

E. Provide piping materials and wall thickness for specific piping systems as listed in piping schedule on plans.

F. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.

G. Piping fitting materials for specific piping systems shall be as listed in piping schedules. Fitting shall be approved factory made type with threaded or weld ends as required. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.

H. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Astroseal teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.

I. Welded pipe joints shall be made by certified welding procedures and welders. Welding electrodes shall be type and material recommended by electrode manufacturer for materials to be welded. All pipe and fittings ends shall be beveled a minimum of 30 degrees prior to welding. Refer to the Part 3.2 Welding for additional welding requirements.

J. Make changes in piping size and direction with approved factory made fittings. Refer to piping material and fitting schedule on plans for type of fittings to be used for each type of system utilized. Provide fittings suitable for pressure ratings indicated on piping material and fitting schedule on the plans.

3.2 WELDING

A. Contractor shall be responsible for quality of welding and suitability of welding procedures. All welding shall be in accordance with American Welding Society Standard B3.0 and ANSI Standard B31.9.

B. Welding shall be done only by welders who have successfully passed welder qualifications tests in previous 12 months for type of welding required. Each welder shall identify his work with a code marking before starting any welded pipe fabrication. Contractor shall submit three copies of a list of welders who will work on project listing welders code, date and types of latest qualification test passed by each welder.

C. Welded joints shall be fusion welded.

D. Bevel all piping and fittings in accordance with recognized standards by flame cutting or mechanical means. Align and position parts so that branches and fittings are set true. Make changes in direction of piping systems with factory made welding fittings. Make branch connections with welding tees or forged weldolets.

E. Quality Control

1. Prior to the start of any welding, submit a summary of the procedures to be followed by all welders performing work on this project.

2. A sampling of the welds provided by the Contractor for this project may be x-rayed by the Owner in an effort to assure quality welding.

   a. The welds to be x-rayed will be selected by the engineer.
   b. The x-rayed welds will be analyzed by a certified x-ray technician.
   c. Allowable anomalies in the welds that are x-rayed shall be as follows:

      (1) Cracks – None permitted.
      (2) Lack of Fusion – The length of unfused areas shall not be more then 20% of the circumference of the pipe, or of the total length of the weld, and no more than 1½ in. any 6 in. of weld.
      (3) Incomplete Penetration – The total joint penetration shall not be less than the thickness of the thinner of the components being joined, except that incomplete root penetration is acceptable if it does not exceed the lesser of 1/32 in. or 20% of the required thickness, and its extent is not more than 1½ in. in any 6 in. of weld.
      (4) Undercut and Reinforcement – Undercut shall not exceed the lesser of 1/32 in. or 12 ½ % of wall thickness. Thickness of weld reinforcement shall not exceed 3/16 in.
      (5) Concave Root – concavity of the root surface shall not reduce the total thickness of the joint, including reinforcement, to less than the thickness of the thinner of the components being joined.
      (6) Excess Root Penetration – The excess shall not exceed the lesser of the 1/8 in. or 5% of the inside diameter of the pipe.
      (7) Weld Surfaces – There shall be no overlaps or abrupt ridges and valleys.

3. If the x-ray of any of the various welds reveal deficiencies greater than allowable as indicated herein, the deficient weld shall be ground out, the joint rewelded, and the new weld x-rayed to prove that the criteria indicating maximum allowable anomalies is adhered to.

   In addition, the Contractor shall x-ray an additional 10 welded joints not previously x-rayed in locations selected by the engineer. All joints shall meet or exceed the criteria stated. If they do not, the deficient weld shall again be ground out and the joint rewelded.

   This process shall be continue until the engineer is satisfied that all welded joints meet or exceed the criteria indicating maximum allowable anomaly in any given weld.

4. The cost for the original x-ray procedure as stated in E2 above shall be by the Owner. All required x-ray procedures or required corrective action subsequent to the original x-ray procedure as stated in E2 above shall be provided by the Contractor.

3.3 TESTING PROCEDURES FOR PIPING SYSTEMS

A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.

B. Where entire system cannot be tested before concealment, test system in sections. Upon completion, each system shall be tested as an entire system.

C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.

D. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings remove or isolate components from system during tests.

3.4 TEST METHODS AND PRESSURES

A. Test methods and pressures shall be as follows:

1. Hydrostatic Test (Closed Systems – Steam Condensate Piping):

a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.

2. Pneumatic Test (Steam Piping):

a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 150% of operating pressure or whichever is greater.
b. Completely isolate entire system from compressor or other sources of air pressure and allow at least 1 hour after test pressure has been applied before making initial test.

3. Pressure Relief and Safety Valve:

a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
b. Tag items that pass test with date of test, observed relief pressure setting and inspector's signature.
c. Items installed in systems without test tag attached will be rejected.

B. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.

C. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.

D. For test pressure schedules refer to plans.

3.5 CLEANING OF STEAM AND CONDENSATE PIPING SYSTEMS

A. After pressure testing of system and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers.

B. Contractor shall install temporary outlet nozzle sized full pipe diameter directed to the building exterior in location as directed by Engineer. Full pressure steam shall be discharged from this pipe for a minimum of 30 min. After pipe cleaning the temporary nozzle shall be removed. This procedure shall be repeated as required to achieve proper pipe cleaning as determined by the Engineer.

END OF SECTION 23 1100

SECTION 23 1200 – EXPANSION COMPENSATORS AND BALL JOINTS

PART 1 – GENERAL

1.1 EXPANSION AND BALL JOINTS

A. Provide expansion joints and ball joints on all steam and steam condensate piping as indicated on the plans.

B. All equivalents not listed in schedule shall be by Engineer approval as listed by addendum only.

PART 2 – PRODUCTS

2.1 EXPANSION JOINTS - STEAM AND STEAM CONDENSATE RETURN

A. Thermal expansion joints shall be Hyspan model 6502 weld end, single slip expansion configuration. Expansion joints shall be designed for packing injection under full line pressure.

B. Rating and Travel: 150 psig working pressure at 500 Deg. F. maximum working temperature. Axial travel shall be 4.0” with a pre-compression of 1.0”.

C. Materials: Traverse chamber and stuffing box shall be seamless steel A-53 GRB pipe or equivalent tubing. Slip shall be machined from A-53 GRV seamless pipe (Schedule 80). Slip shall be plated with 1 mil. of hard chrome applied over 1 mil. of crack-free hard chrome and certified by permascope inspection per ASTM Standard B-499.

D. Equivalent by Advance Thermal Systems.

2.2 BALL JOINTS – STEAM AND STEAM CONDENSATE RETURN

A. Ball Joints shall be Hyspan Barco Type N Style I with weld ends in locations and sizes as indicated on the plans.

B. Ball joints shall be manufactured with carbon steel casing retainer and ball. The retainer shall be bolted to allow correct seal adjustment and disassembly for maintenance. The ball joint shall provide for angular displacement of 15 deg. and shall allow 360 deg. rotational movement.

C. Ball joints shall be provided with inner and outer seals which consist of precision molded rings made from non-metallic Hyspan Barco seal material specifically formulated for 125 psig steam application. The ball sealing surface shall be protected with two mils of chrome plating consisting of one mil of hard chrome over one mil of crack free chrome and baked on molybdenum disulfide lubricant coating.

D. Equivalent by Advanced Thermal systems.

END OF SECTION 23 1200

SECTION 23 1300 – HANGERS AND SUPPORTS FOR HVAC PIPING

PART 1 - GENERAL (Reference Section 230500)

PART 2 - PRODUCTS

2.1 PIPE SLEEVES AND SEALS

A. Furnish proper type and size pipe sleeves to General Contractor for installation in concrete or masonry walls or floors. Unless specifically noted on plans that penetration is core drilled. Mechanical Contractor shall supervise installation of sleeves to insure proper location and installation.

B. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved.

D. Provide steel pipe sleeves in bearing walls and masonry walls. Opening in non-bearing walls, floors and ceilings may be 20 gauge galvanized pipe sleeves or openings cut with concrete core drill.

E. Pipe insulation shall run continuous through pipe sleeves with 1/4" minimum clearance between insulation and pipe sleeve. Provide metal jackets over insulated pipes passing through fire walls, floors and smoke partitions. Jacket shall be 0.018 stainless steel extending 12 inches on either side of barrier and secured to insulation with 3/8" wide band. Seal annular space between jacket and pipe sleeves by installing backing rod and 3M or Hilti Fire barrier caulk.

F. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.

2.2 PIPE HANGERS AND SUPPORTS

A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.

B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.

C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position. Hangers shall not become disengaged by movements of supported pipe.

D. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.

E. Unless indicated otherwise on drawings support horizontal piping as follows:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Steel Pipe		
Up to 1-1/4"	3/8"	8Ft.
1-1/2" to 2"	3/8"	10 Ft.
2-1/2" to 3-1/2"	1/2"	12 Ft.
4"	5/8"	15 Ft.
5" to 8"	3/4"	15 Ft.
10" to 12"	7/8"	15 Ft.
Schedule 80 PVC		
Condenser water pipe		
6" to 8"	3/4"	6 Ft.
10" to 12"	7/8"	7 Ft.

F. Provide continuous threaded electro galvanized hanger rods wherever possible. No chain, wire, or perforated straps shall be used. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Engineer for review prior to fabrication.

G. Provide Grinnell pipe hangers for vertical pipe risers as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Steel	3/4" thru 20"	261

H. Provide Grinnell Fig. 194, 195, or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.

I. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation. See 2.4 for insulation insert requirements at all hangers.

J. Structural attachments for pipe hangers shall be as follows:

1. Concrete Structure: Provide adhesive anchors with a minimum safety factor of 2 for all loads attached there to. All anchors in the tunnel system and KSH parking garage shall be stainless steel.
2. Structural steel beam: Provide Grinnell 133, 228 or equal as required by application.

K. Provide Grinnell pipe hangers for support of horizontal single pipe runs where not supported by a structural steel rack as in the tunnel, KSH parking garage or KSH Vaults.

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Copper	1/2" thru 4"	CT-65
Steel	½" thru 3-1/2"	260
Steel	4" and up	181
Sch 80 PVC	6" and up	181

L. Pipe guides for horizontal piping mounted on structural pipe racks shall be low friction graphite and/or teflon slide supports as manufactured by Tri-State Industries or approved equal.

M. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Engineer prior to installations.

2.3 EQUIPMENT ANCHORS

A. Provide floor or foundation mounted equipment with anchors as indicated on plans.

B. Anchors in floor shall be stainless steel.

2.4 PIPING ANCHORS AND SUPPORTS

A. Refer to drawings for detail of pipe supports and anchors.

B. Insert supports for piping shall conform to the following requirements:

1. Insulated pipe supports shall be supplied and installed by the Mechanical Contractor on all insulated pipe and tubing unless otherwise indicated by the plans. Chilled water piping in the main mechanical rooms, tunnel, KSH parking Garage, northwest KSH mechanical vault, west KSH Utility corridor shall be pre insulated with continuous insulation and vapor barrier provided. Steam and pumped condensate return piping in the main mechanical rooms, tunnel, KSH parking Garage, northwest KSH mechanical vault, west KSH Utility corridor shall have the support welded directly to the pipe with insulation field applied over the support. Type 1 supports provide support for the piping while allowing lateral movement in both X and Y coordinates. All other supports shall provide only axial movement while preventing piping lifting up.
2. All pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes: ASME B31.1, B31.3, MSS SP-58, MSS SP-69, MSS SP-89.
3. Load tests for the load bearing insulation material in the configuration of the support being considered shall be available upon request to the owner or the owner's representative. A minimum safety factor of 5 to 1 at the design temperature shall be used in determining the insulated support load rating.
4. Factory fabricated insulated supports shall consist of two 180 degree segments of high-density insulation material encased in a galvanized sheet metal jacket. On all hot lines the insulation shall be field applied. Supports shall be selected based on support spacing, medium being transported and support method and shall adequately support the piping system with the 5 to 1 safety factor. Insulation thickness of individual pre insulated pipe supports shall match that of the adjacent pipe insulation as indicated on the pipe insulation schedule. Supports and alignment guides shall be manufactured by Tri-States Industries equivalent by Rilco Manufacturing, Pipe Shields, Inc. or approved equal.
5. Pipe supports shall be as indicated in details on the drawings.

END OF SECTION 23 1300

SECTION 23 1400 – VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Provide necessary valves within piping systems to provide required flow control and to allow isolation for inspection, maintenance and repair of each piece of equipment or fixture, and on each main and branch service loop.

B. Valves installed in piping systems shall be compatible with system maximum test pressure, pipe materials, pipe joining method, and fluid or gas conveyed in system.

C. Provide valves 2” and smaller with screwed end connections, valves 2-1/2” and larger with flange connections as required by piping materials, piping system and piping sizes indicated in the valve schedule shown on the plans. Install union connection in the line within two feet of each screw end valve unless valve can be otherwise easily removed from line. Each valve shall be installed so that it is easily accessible for operation, visual inspection, and maintenance.

D. Each valve shall be installed so that it is easily accessible for operation, visual inspection, and maintenance.

E. Provide butterfly valves in full lug body style. Butterfly valves in sizes 6" and below with latchlock handles for On-Off applications and with Twist-Lock infinite position handle for throttling applications. All butterfly valves in sizes larger than 6” shall be provided with gear operators and wheel handles.

F. Install globe valves with pressure on top of disc except that must be completely drained for inspection, maintenance or to prevent freezing shall be installed with stem in horizontal position to insure complete drainage of pipe lines.

G. Non-rising stem valves shall not be installed at any point in the piping systems. With permission of Engineer non-rising stem valve may be installed at particular points where space is restricted.

H. Gate valves shall not be installed in pipe lines where intended for throttling service or where piping is subject to vibration as part of normal operating conditions.

I. OS&Y valves shall be provided in steam and condensate return piping systems in sizes 4” and above. Where valve is at elevations above 6’-0” above the finished floor of a mechanical room or area, a chain wheel operator with chain shall be provided.

PART 2 – PRODUCTS

2.1 SHUT-OFF VALVES, BALANCE VALVES AND CHECK VALVES

A. Provide valves based on pipe sizes, piping system served, and piping material as indicated in the valve schedules shown on the plans.

PART 3 – EXECUTION

3.1 GENERAL

A. Provide valves as indicated in schedule on plans.

B. Install valves that are installed in systems where flanged connections are provided with proper “spiral wound- Flexitaulic” flange gaskets.

C. All butterfly valves shall be provided with full lug body.

D. Where installed in piping systems requiring gasket where installed in piping system connection and requiring flange union where installed in threaded configuration.

E. Where gate valve is installed at elevations above 6’-0” AFF provide chain operator to allow actuation from floor.

END OF SECTION 23 1400

SECTION 23 1500 – HVAC PIPING INSULATION

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Provide necessary materials and accessories for installation of insulation for mechanical systems as specified and/or detailed on drawings insulation type, jacket, and thickness for specific piping systems or equipment shall be as listed in insulation schedule.

B. Provide insulation materials manufactured by Armstrong Cork Co. Certain/Teed Saint Gobain, Dow Chemical, Johns-Manville or Owens-Corning Fiberglass.

C. Insulation, except where specified otherwise, shall have composite fire and smoke hazard ratings as rested by ASTM E-84, NFPA 255, and UL 723 procedures not exceeding:

FLAME SPREAD	25
SMOKE DEVELOPED	50
FUEL CONTRIBUTED	50

D. Provide insulation accessories such as adhesives, mastics, cements, tape and glass fabric with same component ratings as listed above. Products or their shipping cartons shall bear label indicating their flame and smoke safety shall be permanent. Use of water soluble treatments such as corn paste or wheat paste is prohibited. This does not exclude approved lagging adhesives.

E. Install insulation over clean dry surfaces with joints firmly butted together. Insulation at equipment, flanges, fittings, etc. shall have straight edges with box type joints with corner beads as required. Where plumbing and heating insulation terminates at equipment or unions, taper insulation at 30 degree angle to pipe with one coat finishing cement and finish same as fittings. Total insulation system shall have neat smooth appearance with no wrinkles, or folds in jackets, joint strips or fitting covers.

F. Undamaged insulation systems on cold surface piping and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.

G. Where glass fabric is specified in the following insulation methods provide resin impregnated white open weave glass fabric with 10/20 thread count. Provide glass cloth similar to Alpha Martex wettable glass cloth.

H. Abbreviations for manufacturers of adhesive, mastics and coating specified shall be C.M. for Chicago Mastic Company and B.F. for Benjamin Foster Company.

I. Insulation of removable heads, manholes access covers, etc., shall be fabricated to allow removal without damage to insulation. Provide removable units with vapor-proof cover fabricated to be sealed to equipment vapor barrier.

J. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Mechanical Contractors expense at no cost to owner.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS AND APPLICATION METHODS (PIPING)

A. Pipe insulation by type shall be as follows:

1. TYPE 1-PHC: Insulation for hot and cold surface piping systems with -60 degrees F to +650 degrees F operating range shall be Owens-Corning Fiberglass ASJ/SSL-11, 4.2 lb. density pipe insulation with white fire retardant ASJ jacket and double self-sealing lap. Average thermal conductivity shall not exceed .26 BTU/Hr. at 75 degrees F mean temperature. Seal longitudinal jacket laps and butt strips with C.M. No. 17-465 or B.F. No. 85-75 vapor barrier adhesive. Insulate valves and fittings as follows:

a. Insulate exposed and concealed valves and fittings with 2" thick glass fiberglass inserts or blankets. Cover fittings with Zeston Products PVC fitting covers or approved equal. PVC fitting covers shall be secured with mechanical fasteners such as tacks or staples for temperatures above 75 degrees F. For cold service all joints shall be sealed with vapor barrier adhesive or by pressure sensitive vapor barrier vinyl tape.
b. Insulate expansion compensators with self contained, fully jacketed blanket with eyelets to allow the blanket to be laced into place. Jacket shall be rated for anticipated temperatures and shall be durable and shall remain flexible in anticipation of periodic removal and replacement.

PART 3 – EXECUTION

3.1 INSULATION MATERIAL AND THICKNESS

A. Pipe insulation schedule

1. Refer to the piping insulation schedule on plans for pipe insulation material, thickness and installation requirements.

END OF SECTION 23 1500

SECTION 23 2100 – STEAM TO WATER HEAT EXCHANGERS

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Provide where indicated and scheduled on plans, and herein as specified, steam to water heat exchanger.

1.2 EQUIVALENT MANUFACTURERS

A. Provide heat exchangers as manufactured by Bell and Gossett, RECO, Armstrong, Aurora, Taco, Amtrol, Adamson.

1.3 SUBMITTALS

A. Submit drawings indicating components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate accessories where required for complete system.

B. Submit product data indicating rated capacities, weights, and specialties and accessories.

C. Submit manufacturer's installation instructions.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include start-up instructions, maintenance data, controls, and accessories.

1.5 STORAGE AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage.

PART 2 - PRODUCTS

2.1 Steam to water heat exchanger - HVAC heating water application.

A. Provide steam to water heat exchanger constructed in accordance with ASME Section VIII for 'U' tube design.

B. Unit shall be rated 150 psig for shell. Maximum temperature shall be 375 Deg.□F. Test pressure shall be 300 psig.

C. Shell shall be constructed of carbon steel. Head shall be cast iron. Tube sheets and separators shall be steel. Tie rods shall be steel. Tubes shall be copper.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all units in strict accordance with manufacturer's installation instructions.

B. Provide angle iron support structure to mount each heat exchanger. Provide min. 10"x10"x1/2" base plates or each leg of the respective support structure.

C. Anchor all support structure base plates with min. (1) ¾" concrete expansion anchor for each leg.

END OF SECTION 23 2100

SECTION 23 2200 - STEAM CONDENSATE RECEIVERS AND PUMPS

PART 1 - GENERAL (Reference Section 230500)

1.1 MANUFACTURERS

A. Provide custom built steam condensate receivers/pumping units as indicated in schedules and details on plans.

B. Condensate receivers shall be fabricated by Messplay.

C. Condensate pumps shall be manufactured by Grundfos.

D. Each entire unit shall be factory tested and certified for proper operation and tightness prior to shipment.

PART 2 – PRODUCTS

2.1 STEAM CONDENSATE RECEIVER AND PUMPS

A. Provide as specified as indicated in the schedule and in accordance with the manufacturer's instructions duplex, custom built receivers and pumps.

B. The unit shall consist of a tank with material and capacity as scheduled on plans, a float operated control device with high water alarm contacts, and close coupled pumps unless otherwise noted on plans.

C. Provide valves and accessories as indicated on the plans and in the schedule.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Units shall be installed in strict accordance with Messplay installation instructions.

B. Unit installation shall be certified by Messplay authorized technician.

C. Initial start up of equipment shall be by Messplay authorized start up/service technician.

END OF SECTION 23 2200

SECTION 23 3100 – PUMPS

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Furnish and install where shown on plans hot water and chilled water and condenser water circulating pumps end suction and vertical turbine design as indicated in pump schedule on the drawings.

1.2 EQUIVALENT MANUFACTURERS

A. Equivalents by Bell & Gossett, Taco, Armstrong, Amtrol, Aurora.

1.3 SUBMITTALS

A. Submit drawings indicating components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate accessories where required for complete system.

B. Submit product data indicating rated capacities, weights, and specialties and accessories.

C. Submit manufacturer's installation instructions.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include start-up instructions, maintenance data, controls, and accessories.

1.5 STORAGE AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage.

PART 2 - PRODUCTS

2.1 END SUCTION PUMPS

A. Pumps shall be base-mounted, single-stage, end suction design with true back pull-out, capable of being serviced without disturbing piping connections.

B. Pump volute shall be Class 30 cast iron with integrally-cast pedestal support. The impeller shall be cast bronze, enclosed-type, dynamically balanced, keyed to the shaft and secured by a locking capscrew.

C. The liquid cavity shall be sealed off at the pump shaft by an internally-flushed mechanical seal with ceramic seal seat of at least 98% alumina oxide content, and carbon seal ring, suitable for continuous operation at 225 deg. F. A replaceable bronze shaft sleeve shall completely cover the wetted area under the seal.

D. Pumps shall be rated for minimum of 175 psi working pressure. Casings shall have gauge ports at nozzles and vent and drain ports at top and bottom of casing.

E. Pump bearing housing assembly shall have heavy-duty regreaseable ball bearings, replaceable without disturbing piping connections and have foot support at coupling end.

F. Base plate shall be of structural steel or fabricated steel channel configuration fully enclosed at sides and ends, with securely welded cross members and fully open grouting area. A flexible-type coupler, capable of absorbing torsional vibration, shall be employed between the pump and motor, and it shall be equipped with a suitable coupling guard as required. Contractor to level and grout each unit according to manufacturer's instructions.

G. The motor shall meet NEMA specifications and shall be the size, voltage and enclosure called for on the plans. Pump and motor shall be factory aligned, and shall be realigned by Contractor after installation.

H. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

I. Each unit shall be checked by the Contractor and regulated for proper differential pressure, voltage and amperage draw. This data shall be noted on a permanent tag or label and fastened to the pump for Owner's reference.

2.2 VERTICAL TURBINE PUMPS

A. Provide vertical turbine pumps, single stage, double suction type, with pump characteristics which provide rising heads to shut off.

B. Refer to pump schedule on plans for pump flows, heads, motor speed, enclosure, efficiency and power requirements.

C. Pumps shall be an assembly of motor, discharge head, column, inlet strainer, bowl, line shaft and impeller.

D. Discharge head shall be cast iron with ports for connecting pressure gauge, stuffing box bypass return and lubricator connections. The driver support shall have large windows to allow access to stuffing box and for tension plate adjustments. The windows shall be covered with guards.

E. Column shall be carbon steel. Line shaft shall be stainless steel with stainless steel bearing retainer and couplings. Line shaft bearing shall be rubber EPDM. Bearings shall be spaced as required to provide vibration free operation. The shaft shall be supported within the column with bearing retainers.

F. Bowl shall be cast iron with glass enamel interior. Suction bowl shall be cast iron CL 30. Impeller shall be stainless steel. Suction and bowl bearings shall be bronze.

G. A flexible-type coupler, capable of absorbing torsional vibration, shall be employed between the pump and motor, and it shall be equipped with a suitable coupling guard as required. Contractor to install and level each unit according to manufacturer's instructions.

H. The motor shall meet NEMA specifications and shall be the size, voltage and enclosure called for on the plans. Pump and motor shall be factory aligned, and shall be realigned by Contractor after installation.

I. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

J. Pumps shall be hydrostatically tested to 150% of the maximum pump working pressure.

2.3 HORIZONTAL SPLIT CASE PUMPS

A. Horizontal Split Case pumps are single stage, double suction type, with pump characteristics which provide rising heads to shut off. These pumps are existing and shall be relocated from the Docking State Office Building to location indicated on plans.

B. Contractor shall install and level each unit according to manufacturer's instructions.. The pumps shall be realigned by Contractor after installation.

PART 3 -EXECUTION (Not Applicable)

END OF SECTION 23 3100

SECTION 23 5100 – METERS AND GAUGES FOR HVAC

PART 1 – GENERAL

1.1 THERMOMETERS AND GAUGES

A. Provide thermometers and gauges as hereinafter specified and shown on the plans and so that proper testing and balancing and trouble shooting can be accomplished.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Thermometers and Gauges:

1. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
2. Marsh Bellofram.
3. Trerice: H. O. Trerice Co.
4. Weiss Instruments, Inc.
5. Ashcroft
6. Moeller
7. Weksler
8. Taylor

B. Test Plugs:

1. Flow Design, Inc.
2. MG Piping Products Co.
3. National Meter.
4. Sisco Manufacturing Co.
5. Trerice: H. O. Trerice Co.
6. Watts Industries, Inc.; Water Products Div.
7. Peterson

2.2 THERMOMETERS

A. Scale Range: Temperature ranges for services listed are as follows:
1. Condenser Water: 0 to 160 deg F, with 2-degree scale divisions (minus 18 to plus 70 deg C, with 1-degree scale divisions).
2. Chilled Water: 0 to 100 deg F, with 2-degree scale divisions (minus 18 to plus 38 deg C, with 1-degree scale divisions)
3. Hot Water: 30 to 240 deg F. with 2-degree scale divisions (0 to 120 deg C with 1-degree scale divisions).
4. Accuracy:

a. Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.
5. Construction
a. ASTM E 1
b. Case: Die cast and aluminum finished in baked-epoxy enamel, glass front, spring secured, 9 inches (230 mm) long
c. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
d. Tube: Red or blue reading, organic-liquid filled with magnifying lens.
e. Scale: Satin-faced nonreflective aluminum with permanently etched markings
f. Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

5. Thermometer Wells:

   a. Description: Fitting with protective well for installation in threaded pipe fitting to hold test thermometer.
   b. Material: Stainless steel, for use in steel piping
   c. Extension-Neck Length: Nominal thickness of 2 inches (50 mm), but not less than thickness of insulation. Omit extension neck for wells for piping not insulated
   d. Insertion Length: To extend to one-third of diameter of pipe.
   e. Cap: Threaded, with chain permanently fastened to socket
   f. Heat-Transfer Fluid: Oil or graphite.

2.3 PRESSURE GAUGES

A. ASME B40.1, Gauges shall be bourdon tube with minimum 4-1/2" dial and die cast aluminum case with black enamel finish.

1. The movement shall be all stainless steel with Grade A phosphor bronze bourdon tube brazed at socket and tip.
2. The accuracy of the gauge shall be within ½ percent of the scale range.
3. The pointer shall be the micrometer adjustment type recalibrated from the front.
4. Pressure, compound, and differential pressure gauges shall have suitable scale ranges, shall be submitted and are subject to the review of the Engineer.
5. Graduations shall be one pound or less on all gauges where this is standard for the required range.
6. Gauges shall have ¼" IPS connections and shall be Moeller "Vantage" gauges with Case Style No. 2, or approved equal.

2.4 TEST PLUGS

A. SISCO ¼" or ½" NPT fitting (Test Plug) of solid brass at desired indicated locations.

1. Test plug shall be capable of receiving either a pressure or temperature probe 1/8" o.d.

2. Dual seal core shall be neoprene for temperature to 200^{o}F and shall be rated zero leakage from vacuum to 1000 psig.

2.5 TURBINE FLOW METERS

A. Insertion type; measures flow directly in gallons per minute (liters per second).

1. Construction: Bronze or stainless-steel body and plastic turbine or impeller, with integral direct-reading scale.
2. Pressure Rating: 150 psig (1035 kPa) minimum.
3. Temperature Rating: 180 deg F (82 deg C) minimum.
4. Display: Visual instantaneous rate of flow, with register to indicate total volume in gallons (liters).
5. Accuracy: Plus or minus 2-1/2 percent

2.6 INSTALLATION SCHEDULE

`	`Pressure Gauge & Gauge Cock	Pete's Plug	Thermometer & Well	Flow Meter
STEAM SUPPLY FROM EACH BOILER	X			X
INLET STEAM PIPE AT PRESSURE REDUCING VALVE	X			
OUTLET AT PRESSURE REDUCING VALVE	X			
OUTLET PIPE FOR EACH NEW CONDENSATE RETURN PUMP	X			X
CHILLER EVAPORATOR				
ENTERING	X	X	X	X
LEAVING	X	X	X	
CHILLER CONDENSER				
ENTERING	X	X	X	X
LEAVING	X	X	X	
CHILLER HEAT RECOVERY BUNDLE				
ENTERING	X	X	X	X
LEAVING	X	X	X	
SUCTION & DISCHARGE FLANGE EACH NEW PUMP AND EACH EXISTING RELOCATED PUMP	X	X		
OUTLET PIPE FOR EACH NEW CONDENSER WATER PUMP	X			

2.7 FLOW MEASUREMENT SENSORS – IN-LINE-

A. GENERAL:
The contractor shall furnish and install a flow meter which utilizes a Dual D/P technology, (ACCELABAR®), as manufactured by Armstrong International. The METER BODY and element shall be made from 316SS, as manufactured by Armstrong International.

B. CONFIGURATION:
The flow meter shall consist of a patented and unique toroidal nozzle design and a Verabar sensing element. The meter body shall have an integral port for an optional RTD. A metal tag (SST) shall be permanently attached to the flow sensor showing Model No., Serial No., Pipe I.D., Tag No., Max Pressure & Temperature, Max D/P, Max allowable insertion D/P and Flow coefficient.

C. MATERIALS:
The meter body and element shall be made of 316 stainless steel for sizes 3, 4, 6, 8,10 & 12" utilize a 316SST flow element and OPTIONAL CS mating flanges / body. The measuring station shall be rated up to 600 # ANSI depending on the application conditions and the sensor specified. Up to and including 2500 # ANSI upon request.

D. ACCURACY & REPEATABILITY:
The accuracy of the flow element shall be within +/- 0.75% of actual flow rate over a MAXIMUM flow turndown of up to 65:1. The installation of the meter shall require NO STRAIGHT RUN regardless of the upstream piping configuration. Certified test data from independent flow laboratories shall be provided as verification. The repeatability of the flow element shall be +/- 0.075% of actual value over the entire flow range.

E. QUALITY:
The sensor shall be designed and manufactured under the control of an ISO 9001 program.

F. FLUIDS:
Liquids, gases and steam.

G. SENSOR TYPE:
The sensor type shall be an in-line assembly type in accordance with the below schedule and sizes.

***NOTE THAT THE GAUGES SHALL BE REMOVED AND TURNED OVER TO THE OWNER IN A CARRYING CASE AT THE COMPLETION OF THE PROJECT**

PART 3 – INSTALLATION

3.1 INSTALLATION

A. Gauges shall be installed as hereinafter specified. Gauge cocks shall be polished brass A10 ¼" tee handle type with threaded ends. 125 psi rated for all systems rated less than 100 psi and shall be 200 psi rated for systems that are rated 100 psi or more. Provide gauge cock with ¼" pipe nipple for connection to gauge cock.

B. Flow meters in condensate piping shall be installed in 2" vertical condensate receiver discharge piping. Increase size of piping line according to documents in the horizontal run following the flow meter. Where meter requires installation more than 60" AFF, provide meter with junction box for remote Primo Amplifier. No equivalents shall be used on this project.

C. Flow Meters in steam piping shall be installed in the supply piping for each boiler in locations as indicated on the plans. Reference the boiler specification for steam flow meters.

D. In addition to that indicated in the installation schedule above, flow meters shall be installed in the chilled water supply lines to the north Kansas Statehouse and the new energy center. Flow meters shall also be installed in the hot water heating piping that supplies the new energy center.

END OF SECTION 23 5100

SECTION 23 6100 - DUCTWORK

PART 1 – GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Construct ductwork as detailed on drawings and as detailed in the latest edition of the Sheet Metal and Air Conditioning Contractor's Association (SMACNA) Duct Manual. Details shown on project plans shall indicate specific construction methods to be used on this project, and shall be used in lieu of any alternate methods shown in SMACNA Duct Manual.

B. Construct and install ductwork to be completely free from vibration under all conditions of operation. Support and securely anchor ductwork and equipment from structural framing of building. Provide suitable intermediate metal framing where required between building structural framing.

C. Construct ductwork in accordance with operating static pressure range. Ductwork pressure classifications shall be as follows:

1. Low Pressure Ductwork: System operating static pressure 1.5" positive or negative of W.G. or less and velocities less than 2500 FPM.
2. Medium Pressure Ductwork:

D. All metal ductwork scheduled for interior thermal and acoustical liner is not sized on plans to include the proper thickness of insulation. Add 1" or 2" in height and width of ductwork as required to accommodate insulation thickness. Mount specialties such as turning vanes, campers, etc., to ductwork with that section insulated "Build Outs" to maintain continuity of thermal barrier.

E. Construct low pressure system ductwork to conform to latest edition of low pressure duct construction standards of SMACNA Duct Manual.

F. Sealing of low pressure ductwork shall be as follows:

1. Option #1: Low pressure ductwork: Including supply, return and exhaust. Provide Hard Cast, Inc. mineral impregnated woven fiber tape and activator/adhesive in accordance with manufacturers' directions on all joints, connectors, etc.
2. Option #2: Low pressure rectangular ductwork: Provide "Ductmate" systems as manufactured by Ductmate Industries, Inc. or an approved equal system.
3. Option #3: Miracle metal duct sealer model No. 617.

G. Provide external insulation on exhaust fan and intake hood ductwork.

1.2 RECTANGULAR STEEL

A. Provide new commercial quality, bright spangled galvanized sheet steel manufactured in the U.S.A.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 INSTALLATION

A. All ductwork shall be installed in strict accordance with the most current edition of the SMACNA "HVAC Duct Construction Standards".

END OF SECTION 23 6100

SECTION 23 6200 - DUCTWORK ACCESSORIES

PART 1 – GENERAL (Reference Section 230500)

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including general and supplementary conditions and Division 1 Specification Sections, apply to work of this section.

PART 2 – PRODUCTS

2.1 SHEET METAL SPECIALTIES

A. Specialties shall be factory fabricated items designed for low, medium or high velocity systems as required. Submit shop drawings on all specialties required with shop drawings of ductwork layout. Specialties shall be as follows:

1. Turning Vanes: Provide single width turning vanes with min. 24 gauge blades and runners. Note: Turning vanes to be provided on all low velocity supply, return and exhaust ducts.
2. Extractors (Low Velocity): Carnes #1250 all aluminum air volume extractor. Unit shall be adjustable from full open to full closed position. Provide channel supports where recommended by manufacturer (length over 16", height over 8"). Provide Young end bearings and rod with regulator as hereinafter specified.
3. Dampers: Provide 24 gauge minimum galvanized metal blades supported on duct with metal supports and locked in position with locking type damper arm.
4. Backdraft Dampers: Unless backdraft dampers are specified with a particular piece of equipment. Provide Cesco #BDA or equal with 16 gauge aluminum blade with oiled bearings mounted in steel frame. Blades shall be balanced and connected with tie bar. Provide end seals and blade seals. Equivalent by Ruskin.
5. Backdraft dampers: Where backdraft dampers are shown on plans installed behind wall louvers or roof relief vents, provide Cesco #BDA-101-H heavy-duty construction counter balanced to assist air flow complete with end seals and blade seals.
6. Flexible Connections: Metaledge Ventglas prefabricated flexible connection of 3-1/4" wide heat and fire resistant neoprene coated glass fabric with two 3" wide 24 gauge metal strips attached to each edge. Vent Fabrics, Inc., Duro-dyne Corp. or equal.
7. Round take-off fittings: Round take-off fittings from supply diffusers or registers to low pressure supply ductwork shall be Flexmaster #FLDE complete with locking damper and air scoop. Equivalent by Atco, Air Control Products.
8. Wall Louvers: Provide Greenheck model EDD-401 fabricated aluminum stationary blade louver with extruded drainable horizontal blades, extended sill and birdscreen where shown on drawings. Verify size shown with architectural drawings to comply with opening sizes required. All louvers are to be one continuous, louver of sizes shown with no mullions or reinforcing strips showing from outside face of louver. Provide louvers in prime coat of paint. Blades shall be a min. .081 thick aluminum. Frame shall be min. .081 thick extruded 6063-T5 aluminum. Equivalent by Carnes, Louvers and Dampers, Titus.
9. Fire Dampers: Prefco 'LPB' low profile 1 1/2 hr rated. Stacked blade design for minimum reduction of cross sectional area of penetrations and ducts. 165 degree fusible link. Equivalent by Nailor, Greenheck, Ruskin, Air Balance.
10. Low Pressure Flexible Duct: Thermaflex M-KC rated for 2" W.G. maximum positive and 2" W.G. maximum negative pressure and 2500 FPM maximum velocity. UL listed "UL-181 Standards Class I Duct Material" complying with NFPA Standards 90A and 90B. Duct shall be composed of inner polymeric linner duct bonded to coated steel wire helix.

Fiberglass insulation and outer vapor barrier cover suitable for installation in return air plenum. Equivalent by Cleavaflex, Flexmaster.

11. Roof Ventilators: Provide low silhouette intake ventilators constructed from galvanized steel where located on plans. Ventilator shall be equipped with enlarged hood for protection against water entrainment, PVC coated birdscreen. Unit shall have continuously welded curb cap seams. Provide unit with prime coat finish. Unit shall be field painted by G/C. Refer to schedule on plans. Equivalent by Penn, Greenheck, Titus.

PART 3 – EXECUTION

3.1 INSTALLATION

A. All ductwork accessories shall be installed in strict accordance with manufacturers requirements SMACNA, NFPA 90A and 90B, UL listings and drawing details.

END OF SECTION 23 6200

SECTION 23 6300 - DUCTWORK INSULATION

PART 1 – GENERAL (Reference Section 230500)

PART 2 – PRODUCTS

2.1 DUCTWORK INSULATION

A. Provide necessary materials and accessories for installation of interior and exterior ductwork insulation as specified and/or detailed on drawings. Insulation type and thickness for specific ductwork systems shall be as listed in insulation schedule in this section of specification. Provide insulation materials manufactured by Schuller, Knauf Fiberglass, Certain/Teed, or Owens-Corning Fiberglas.

B. Insulation and application adhesives, except where specified otherwise, shall have fire and smoke hazard rating as tested by ASTM E-84 procedure not exceeding:

FLAME SPREAD	25
SMOKE DEVELOPED	50
FUEL CONTRIBUTED	50

C. Insulation shall meet ASTM C411 performance test and shall be installed in conformance with NFPA Standard 90A.

D. Install interior duct liner insulation cut to insure tight fitting corner, and longitudinal joints. Apply liner to sheet metal with 100% coverage of adhesive applied in accordance with manufacturers recommended applications rate. Coat all edges of liner with adhesive. Provide mechanical fasteners on surfaces 18" or wider in addition to liner adhesive with fastener clips set flush with duct liner surface. Provide fasteners as follows:

1. Low Velocity Ductwork (Velocities less than 2000 FPM): Provide fasteners within 3" of leading edge of each section 12" O.C. around joint perimeter and 3" from longitudinal joints 12" O.C. Elsewhere space fasteners 18" O.C. except not more than 6" from longitudinal joints and not 12" from corner break.

E. Provide round sheet metal ductwork with exterior thermal insulation of type and thickness listed in insulation schedule. Apply insulation with joints tightly butted together with longitudinal and end joint strips sealed with vapor barrier adhesive. Insulate fittings with insulation thickness equal to adjoining insulation with cover overlapping 2" onto adjacent covering.

F. Eliminate ductwork insulation on exposed round ductwork unless noted otherwise in ductwork insulation schedule.

G. Duct insulation materials by type shall be as follows:

1. Type 1-DIL: Internal acoustical and thermal duct insulation for low and high velocity ductwork shall be 2 lb. density for 1/2" thick and 1.5 lb. density for 1" thick duct liner with 1.08 @ 1000 FPM friction coefficient and .24 BTUH thermal conductivity at 75 degrees mean temperature.
2. Type 2-DEW: External thermal insulation for low, medium and high pressure duct shall be 1.0 lb. density standard duct insulation type IV with foil-scrim-craft facing and .27 BTUH thermal conductivity at 75 degrees mean temperature.
3. Type 3-DEW: External thermal insulation for low pressure ductwork. Fiberglass with .23 Btuh thermal conductivity at 75^{o}F mean temperature and fire retardant polyethylene .003" thick jacket. Insulation shall be pre-manufactured sleeve type for installation over round low velocity ductwork.

H. Specific insulation materials and installation methods for ductwork systems shall be as follows:

DUCTWORK SYSTEM	DUCT INSULATION TYPE	THICKNESS
Low Pressure Rectangular Supply & Return, Exhaust	1-DIL	1/2"
Rectangular Outside Air	2-DEW	1-1/2”
Relief and Return Air Boots	1-DIL	1/2"
Round Ductwork	2-DEW	1-1/2"

END OF SECTION 23 6300

SECTION 23 7100 – MODULAR AIR HANDLING UNITS

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Provide where shown on plans air handling unit as hereinafter specified, and indicated in the schedule on the plans.

B. All air handling units shall be by one manufacturer

C. Equivalents by Trane, Carrier, McQuay, York.

PART 2 - PRODUCTS

2.1 AIR HANDLING UNITS

A. All units shall be tested rated and certified as complete units in accordance with ARI Standard 430-66 and shall bear the ARI seal. Units shall be factory built and factory tested.

B. All units shall be of quality construction, braced, and reinforced for service intended. Removable panels (minimum 18 gauge) shall provide access to all internal parts. A double drain pan with glass fiber insulation between pans shall be furnished to meet requirements of NFPA-90A. Horizontal units shall have the drain pan extended under both fan and coil sections. Drain pans shall have a drain connection on both sides of unit. All unit panels shall be insulated with 1" thick 1-1/2 lb. density neoprene coated insulation. Provide two fan section hinged and latched access doors. Access doors shall be double wall with heavy duty ventlock style handle. Access door to fan section shall have 8"x8" view window.

C. Centrifugal fans shall be of forward curved type with each fan wheel dynamically balanced and tested while installed in unit casing. Fans shall not pass through their first critical speed at any cataloged RPM. Bearings shall have a 200,000 hour average life and shall be greased lubricated with grease fittings extended to the drive side of the unit casing.

D. Air handling units shall be furnished with a combination mixing and medium capacity filter box with full size hinged access door for filter removal. Provide 2" throw away filters. FARR 30/30 or equal. Access door shall be double wall with heavy duty ventlock style handle. Install new filters prior to the start of balancing and provide (1) year supply of filters.

E. Motors shall be mounted on an adjustable mount furnished by manufacturer. All drives shall be adjustable V-belt type suitable for adjustment to within plus or minus 10% of required RPM and selected at 1.4 x MHP. BHP for each unit shall include belt and drive losses. Unit manufacturer shall provide an enclosed belt guard with hole located to take RPM readings unless motors are internally mounted. Where required, motors shall be capable of operating in conjunction with a variable speed controller. Unit manufacturer shall balance fan at 100 RPM increments up to fan maximum design RPM. Motors, shall be TEFC, with full size double wall access door with heavy duty ventlock style handles and view window where internally mounted for inspection. Provide one additional sheave per unit. First sheave shall be of the adjustable type for balancing, and shall be replaced with a fixed sheave at the completion of the system balance.

F. Cooling and heating coils capacities shall be certified by ARI Standard 410.

G. Aluminum plate fins with collars drawn, belled, and firmly bonded to copper tubes by mechanical expansion of tubes. No soldering or tinning shall be used in the bonding process. Coils shall have galvanized steel casing and shall be mounted pitched in the casing. Coils shall be removable through the unit panel. Coils shall be proof tested at 300 psig air pressure under water.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to details and schedules on plans for specific installation requirements and orientation for each air handling unit.

B. Each air handling unit fan shall be mounted on spring type vibration.

END OF SECTION 23 7100

SECTION 23 7200 – VARIABLE AIR VOLUME BOXES

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Furnish and install where shown on plans EH Price shut-off terminal unit with hydronic heat as scheduled.

B. All variable volume boxes shall be by one manufacturer

C. Equivalent by Carrier, Titus, Trane.

PART 2 - PRODUCTS

2.1 VARIABLE AIR VOLUME BOXES

A. Casing shall be 22 gauge galvanized steel.

B. Interior surface of unit casing is acoustically and thermally lined with 1 inch, 1.9 lb/cu. ft., R-Value 4.2, density glass fiber with high density facing. Insulation is UL listed and meets NFPA-90A and UL 181.

C. The VAV box shall be provided with the required equipment to interface with the Building Automation Control (BAC) system. This shall include transformer, static pickups and electric actuator to accept a 24 VAC incremental signal VAV box manufacturer shall accept the DDC controller at the factors and shall mount and wire all components prior to shipping VAV box.

D. Casing outlet connector for sheet metal duct connection shall be provided.

E. All units are UL listed and CSA approved.

2.2 AIR CONTROL DAMPER

A. The air flow control device with an integral electric actuator with electronic pressure independent controls coordinate with automatic temperature control manufacturer. Inlet shall be tapered to fit standard round flexible ductwork. Maximum leak rate is 1 percent at 4 inches wg. inlet static pressure,. Integral multiple point, averaging flow sensing ring to provide primary air flow measurement with ± 5 percent of unit rated airflow with 1-1/2 diameters of straight duct upstream of unit. Integral flow taps and calibration chart provided on each unit.

2.3 WATER COILS

A. Provide one or two-row water coil designed for heating only, coil shall have aluminum fins which are mechanically bonded to seamless copper tubes. All coils are specifically designed and circuited fro water use. Coils shall be factory tested with 450 psi air under water. Maximum standard operating conditions are: 200 psig, 200 F. Sweat type connections shall be provided.

B. Refer to schedule on drawings for capacity and size requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all variable air volume boxes in strict accordance with manufacturer's installation instructions.

B. Refer to schedule on plans for specific VAV terminal requirements.

END OF SECTION 23 7200

SECTION 23 7300 – DIFFUSERS, REGISTERS, GRILLES, AND LOUVERS

PART 1 – GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Provide grilles, registers, and diffusers where scheduled on Drawings.

B. Provide submittals of diffusers and grilles used on this project as specified in Section 230500.

PART 2 – PRODUCTS

2.1 GRILLES, REGISTERS, DIFFUSERS, AND LOUVERS

A. Provide grilles, registers, diffusers, and louvers as shown on the Drawings and hereinafter specified. Set all units with rubber gaskets for air tight connection with mounting surface. See drawings for types, sizes, air flow and quantity.

B. Refer to drawings for manufacturer and model for each type that was the basis of design. Provide equipment that meets the sound, pressure drop, and throw characteristics.

C. Equivalent louvers by Price, Greenheck, Titus, Louvers and Dampers.

PART 3 – EXECUTION

3.1 GENERAL

A. Install all louvers with curve of louver down.

B. Provide proper mounting supplies and arrangements for areas shown.

END OF SECTION 23 7300

SECTION 23 7500 – FAN COIL UNITS

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Provide fan coil units as indicated and scheduled on plans, Equivalent units by Carrier, York, McQuay, Trane.

PART 2 - PRODUCTS

2.1 PERFORMANCE DATA

A. Capacity: Unit capacities certified under Industry Room Fan Coil Air Conditioner Certification Program in accordance with ARI Standard 440-93.

B. Safety: All standard units are Underwriters Laboratory labeled and approved.

2.2 HORIZONTAL BASIC UNIT

A. Basic unit includes chassis, coil(s), drain pans with polystyrene insulating liner, thermoplastic auxiliary drain pan, fan wheel(s), fan housing(s), and motor. The chassis is the structural frame and is constructed of 18-gauge galvanized steel. Unit is acoustically and thermally insulated with closed cell insulation.

2.3 HORIZONTAL CABINET

A. Bottom panels are of 16-gauge galvanized steel. All other panel parts are of 18-gauge galvanized steel. All cabinet parts are rigidized by channel forming. End panel is removable for piping access. Discharge grille is recessed to resist condensate formation. Hinged access door is flush with top.

2.4 CONCEALED/RECESSED BASIC UNIT

A. Basic unit includes coil(s), coil supports, fans and fan casings, motor fan board and drain pan. Drain pan insulation is closed cell sheet liner. Steel parts exposed to moisture are galvanized. Fan board assembly and drain pan are easily removable. Exposed panels on recessed units are of 18-gauge steel and ship separate from the unit.

2.5 FINISH

A. All cabinet parts and exposed recessed panels are cleaned, bonderized, phosphatized, and painted with any of six available decorator colors. Standard finish meets ASTM B117 specifications (salt spray test).

2.6 FANS

A. The aluminum fan wheels are centrifugal forward-curved and double-width. Fan wheels and housings are constructed of formed sheet metal.

2.7 MOTORS

A. All permanent split capacitor motors are run tested in assembled units. All motors have integral thermal overload protection and are permanently lubricated. Motors are capable of starting at 78 percent of rated voltage and operating at 90 percent of rated voltage on all speed settings. Motors can be operated at 10 percent over voltage without undue magnetic noise and with a temperature rise by the winding resistance method not exceeding 50 C at full speed, and 55 C at reduced speeds.

2.8 COILS

A. All water coils are burst tested at 450 psig (air) and leak tested at 300 psig (air under water).

B. Maximum main coil working pressure is 300 psig. Maximum entering water temperature is 200 F. Tubes and U-bends are 3/8" OD copper. Fins are aluminum and are mechanically bonded to the copper tubes. Connections are expanded to accept standard 3/8" OD copper tubing.

2.9 PIPING PACKAGES

A. All piping packages are burst tested at 450 psig (air) and leak tested at 300 psig (air under water). The piping packages maximum working pressure is 300 psig.

B. Piping package shall be designed so that any condensation is directed into the auxiliary drain pan. Insulation of piping package is not required. Stop valves shall be ball type.

2.10 FILTERS

A. Filters are concealed from sight and easily removable without displacing front panels and with no additional tools required. Filters shall be one-inch throwaway or one-inch pleated media throwaway.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unit leveling and Drain Line Pitch: Set unit level by checking the casing. Provide a drain line pitch of one-inch drop per ten feet.

B. Install unit in strict accordance with manufacturer's installation instructions.

END OF SECTION 23 7500.

SECTION 23 7600 – CENTRIFUGAL POWER ROOF EXHAUST FANS

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL REQUIREMENTS

A. Provide where shown on plans exhaust fans as hereinafter specified. Reference the exhaust fan schedule on plans.

B. Equivalent by Carnes, Cook, Greenheck, Penn, ACME, Powerline, JennAire.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL POWER ROOF VENTILATOR

A. Centrifugal power roof exhaust fans shall be provided with ventilator covers of aluminum specifically designed to withstand high wind loads. Wheels 12" in diameter and larger shall have air foil or medium foil blades. The motor and drive compartment shall be positively externally ventilated. Drive components shall be isolated from the structure. Bearings shall be designed for 200,000 hours operation.

B. Horsepower shall not exceed the values shown and oversize motors will not be acceptable.

C. Ventilators shall be furnished with acceptable electrical disconnect and birdscreen. Single phase motors shall have integral overload protection. V-belt drives shall be adjustable. Furnish units in prime coat finish for field painting by G/C. Provide electric motorized backdraft dampers to open when fan motor is started.

D. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure.

E. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators, out of the airstream.

F. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants.

G. Motors shall be readily accessible for maintenance and a means of inspecting, cleaning and servicing the exhaust fan.

H. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.

I. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings.

J. Bearings shall be selected for a minimum of 150% of driven horsepower.

K. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.

L. Motor pulleys shall be adjustable for final system balancing.

M. A disconnect means shall be factory installed and wired from the fan motor within the motor compartment.

N. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.

O. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Reference mechanical drawings for installation requirements.

END OF SECTION 23 7600

SECTION 23 8100 - SCOTCH MARINE PACKAGED BOILERS

PART 1-GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Specifications, apply to this section.

B. Basic Mechanical Materials and Methods sections apply to this section when so designed in the applicable contract documents.

1.2 SUMMARY:

A. This specification applies to packaged, factory-assembled and tested, firetube steam boilers, trim, and accessories.

1.3 SUBMITTALS:

A. Product Data - Manufacturer's technical data shall be presented prior to start of fabrication in an organized submittal and shall include the following:

1. Boiler:
   a. Product General Arrangement Drawing.
   b. Rated capacities of selected models.
   c. Product dimensions including required clearances.
   d. Unit weights (shipping and operating).
2. Boiler Controls, Trim, & Instrumentation:
   a. Bills of Materials listing manufacturer, models, and quantity of supplied components.
   b. Control Panel Layout Drawings.
   c. Panel Controls and Indicators Layout Drawing.
   d. Wiring schematics.

B. Operating & Maintenance Instructions - O & M manuals shall be compiled in an organized volume and submitted as a part of the original submittal. The manuals shall include the following:

1. Pre-commissioning installation, checks, and adjustment instructions.
2. Warranty information
3. Maintenance data for components and system.
4. Preventative maintenance schedules or recommendations.
5. Vendor data or "cut sheets" on major components.
6. Boiler General Arrangement Drawing.
7. Piping & Instrument Diagrams.
8. Control panel layout drawing.
9. Instrument & Electrical component bill of material.
10. Copy of ASME P-2, P-4, P-6, P-7, and U1A forms.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications:

1. Manufacturer must be regularly engaged in the manufacture of scotch marine boilers of types and capacities required with products satisfactorily used in similar service for not less than 10 years.
2. The manufacturer must have a written Quality Control manual and program which is currently maintained.

B. Codes and Standards:

1. Boiler testing and rating will be in accordance with American Boiler Manufacturer's Association (ABMA) "Packaged Firetube Rating".
2. Minimum steady-state efficiency of boilers will not be less than prescribed by ASHRAE 90A "Energy Conservation in New Building Design".
3. High pressure boiler construction will be in accordance with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. Pressure vessels shall bear the appropriate ASME stamp.
4. Electrical installations shall comply with National Fire Prevention Association (NFPA) Code- 70 “The National Electrical Code”.
5. Gas Fired-boiler installations shall be in accordance with National Fire Protection Association (NFPA) Code 54 "National Fuel Gas Code".
6. Ancillary electrical components shall be Underwriters Laboratories (UL) listed and labeled.
7. The installation and equipment shall be in accordance with ASME CSD-1.
8. The installation and equipment shall be in accordance with NFPA 8501 when so designated in the applicable contract documents.
9. The installation and equipment shall be in accordance with Factory Mutual (FM) requirements when so designated in the applicable contract documents.
10. The installation and equipment shall be in accordance with local codes and other guidelines and requirements when specifically delineated in applicable contract documents.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Packaged boiler critical envelope dimensions shall be provided to allow review for clearances prior to transport or insertion into restricted spaces.

B. Exposed electrical components that may be subject to transportation damage due to ambient exposure shall be wrapped and isolated with appropriate elastomer or weatherproofing material at the factory.

C. Exposed physical utility connections (flanges, pipe ends, etc.) shall be isolated for transport from ambient influences with appropriate blinds, caps, or weatherproofing materials.

D. Manufacturer shall provide lifting lugs at points of crane or lift attachment. Lifting load (weight) shall be provided by the manufacturer.

E. Water shall be drained from all water storage areas, piping systems, valves, and components prior to shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Approved packaged firetube boiler manufacturers must be subject to and in compliance with this specification and other applicable contract requirements. Approved manufacturers include the following:

Johnston Boiler Co.
York Shipley Global
Cleaver Brooks
Only other pre approved equivalent that is listed by subsequent addendum

2.2 PACKAGED FIRETUBE BOILER

A. Steam Boiler: The selected unit shall be a scotch marine packaged firetube steam boiler. The boiler (pressure vessel), burner, fuel and combustion air delivery systems, burner management systems, electrical control, and feedwater shall be specifically engineered as a compatible packaged system. The system, boiler, and accessories shall be factory mounted on a heavy steel base frame. Burner control panels will be shipped loose for remote mounting in the field. Solid supports or saddles should be used to attach and provide placement of the pressure vessel with the frame and package. The packaged unit shall be designed to be transported and installed with a minimum of field assembly required.

B. General Boiler Specifications: The boiler shall be designed to provide reliable and consistent performance to the operating parameters as indicated in the schedules as indicated on the plans.

C. Special Warranty

1. Boiler tubesheets, furnace and rear combustion chamber shall be warranted for a period of 15 years after installation, parts and labor included.
2. All other equipment shall be warranted for 1 year, parts only.

2.3 BOILER SPECIFICATIONS

A. Boiler (pressure vessel): The boilers shall be a four-pass waterback Scotch Marine type listed and rated by the American Boiler Manufacturers Association, Firetube Section. The boiler will be designed and built to comply with the latest ASME Code Rules for 150 lbs per square inch working pressure and be inspected and stamped by an authorized boiler inspector. The boiler design shall include the following features to provide optimized efficiency and unit life:

1. The combustion chamber shall be fully submerged within the boiler water and four pass heated gas contact configuration.
2. Boiler furnace tube shall be corrugated.
3. The boiler shall have a minimum of five (5) square feet of heat transfer surface per rated boiler horsepower, measured on the fireside (ASME method calculation).
4. The boiler shall be constructed with 12 gauge firetubes, ¾" tube sheets and ¾" ligament spacing.
5. The boilers shall have two separate rear tube sheets with "water back" design.
6. The boilers shall have tubes attached by prossering, roller expanding, and beading.
7. Connections for bottom blowoffs shall be supplied on both ends of the boiler shell.
8. Openings for trimmings and external connections shall be flanged and/or threaded.
9. A minimum of five (5) hand holes and one manhole for thorough inspection and cleaning shall be provided.
10. The boiler shall be equipped with a standby steam heating coil "belly heater" to maintain boiler temperature when offline without firing the burner. Steam sparger tubes are not acceptable.
11. The boiler shall be equipped with a steam baffle to ensure steam quality and prevent water carry over.
12. Gas tight inspection doors shall be provided.
13. Boilers must bear ASME Stamp and be inspected under National Board Rules.

B. Front and Rear Flue Doors:

1. The boiler's front and rear flue doors shall be:

a. Hinged or davited for easy access and interference clearance.
b. Sealed with heat resistant gaskets.
c. Fastened with lugs or threaded studs with nuts and washers.
d. Designed so that front and rear tube sheets and all flues are accessible for inspection and cleaning when doors are open.
e. The doors shall be thermally insulated with ceramic fiber blanket insulation.

2. Front and rear flue doors shall carry a full fifteen (15) year parts and labor warranty.

C. Exhaust Gas Vent: Boilers shall have a flanged flue exhaust vent at the top front of the boiler. The vent is to include a 8" diameter stack thermometer and will be designed for convenient connection to flue or stack exhaust.

D. Insulation and Jacket: The boiler shall be factory insulated around its full circumference with 2" thick fibrous, no asbestos containing, insulation. The insulation shall be held in place by spacer pins welded to the shell and covered by a corrosion resistant galvanneale sheet metal jacket. The jacket will be assembled with lock seam joints. Insulation shall also be provided on the boiler rear head. The jacket shall be designed and arranged to provide adequate support for personnel along the top centerline of the boiler to facilitate installation and inspection work.

E. Boiler Trim: The boiler shall include the following control and accessory equipment (trim):

1. Water Column complete with chain operated try cocks, reflex gauge glass, and water column blowdown valve.
2. Modulating Feedwater Control will be an integral part of the water column. The control will be selected to automatically actuate a motor driven feedwater valve to maintain boiler water level within normal limits.
3. Low Water Cutoff shall be an integral part of the water column. The LWCO shall be factory installed and wired into burner control circuits to prevent burner operation if water level falls below safe operating limits.
4. Auxiliary Low Water Cutoff will be supplied. The ALWCO will be a second probe type low water cutoff, installed external to the pressure vessel to activate below the primary low water cut-off.
5. A continuous surface water blowoff connection shall be provided with surface skimmer.
6. Bottom blow down valves are to be provided when specified in the applicable contract documents. The blowdown valves will include one/two quick opening and one/two slow opening valve(s) factory mounted and hydro tested on the boiler or as required by code.
7. Feedwater piping will be provided and will include a 3-valve bypass with electrically actuated modulating feedwater valve hydrostatically tested on the boiler and removed for shipping.
8. Steam Pressure Gauge: Steam pressure gauge shall be located on the front end of the boiler. The gauge installation shall include siphon, shut-off cock and test connection. Gauge range shall suit the specified design pressure.
9. Steam Safety Valves shall be provided in types, sizes and quantities to comply with ASME Code requirements.
10. Steam Pressure Controls will be provided to regulate the burner operation and boiler output and safety.
11. ASME piping and valve package to include feedwater and blowdown valves.
12. Data Reports: The equipment supplier shall provide copies of data reports for boiler, steam piping spools per drawings, and steam isolation valves, ASME form P-2, P-4, P-6, and P-7 (when applicable).

2.4 BURNER AND COMBUSTION CONTROLS

A. Burner Manufacturer: The boiler package shall include a high efficiency Limpsfield Combustion Model LCNO53 (**NO ALTERNATES will be entertained**). The Limpsfield burner shall have the following performance:

Natural Gas
3 % O2 (or less) throughout the entire firing range.
<10 ppm CO throughout the entire firing range.
10.5 % CO2 throughout the firing range.

#2 Fuel Oil
3.5 % O2 (or less) throughout the entire firing range.
Smoke Number of 1 or less.
13.5 % CO2 throughout the firing range.

B. Burner Design: The burner(s) will be a high efficiency, low O2, industrial forced draft burner design, suitable for firing Natural Gas and #2 Fuel Oil. Burner will use independently characterized fuel / air ratio curves for the rated capacity on each fuel. Combustion control will be accomplished using independent direct-coupled servomotors on the inlet air damper assembly and fuel valve(s) so that no mechanical linkages are required. A radial, split head design, gas distribution assembly will be used to facilitate adjustment of gas and air mixing efficiency. Burner will be selected specifically for firing the specified boiler design, and will comply with the required boiler output without any flame impingement on the boiler furnace surfaces.

C. Burner Construction: The burner shall include the following construction features:

1. Manufactured from a rigid steel fabrication and finished in powder-coated paint.
2. Burner blast tube, combustion cone and diffuser will be constructed of high-grade high temperature stainless steel.
3. Sight glass will be air cooled and provided at the front of the burner with minimum 8” diameter flame viewing port for clear view of combustion process.
4. Flame Scanner shall be UV self-checking.
5. Air louvers shall be integral to the burner housing and provided with pivoted bearings for limited hysteresis. Louvers will be a multi-bladed damper assembly operated via direct-coupled positioning servomotor.
6. The burner diffuser, oil lance and complete combustion head assembly shall be removable from the burner without removal of the burner wind box from the boiler.
7. The burner will operate quietly without pulsation; have turndown range on gas firing of at least 6 to 1.
8. High-energy spark ignition shall be accomplished at low fire or choke position light off. Direct spark ignition will be implemented using a separate gas pilot probe assembly. Oil light off will be accomplished without the requirement of pilot gas.
9. Gas flow control to the burner will be controlled using a burner mounted butterfly valve specifically selected for the duty and operated via a direct coupled positioning servo motor accurate to 0.1 degrees angular, ensuring infinite repeatability.
10. Oil control on the burner will be hydraulically operated to ensure absolutely no after burn, this will be achieved by a piston controlled shutoff valve closing directly on the nozzle outlet. The oil volume throughput will be controlled via a V-slot spill back valve, operated by an infinitely repeatable servomotor accurate to 0.1 degrees angular. The burner high-pressure nozzle will operate with a 363 psig supply pressure an manufactured from high alloy steel ensuring the best possible burn out behavior of variable oil quality.
11. A separate forced draft fan mounted on the burner front will be electric motor driven of sufficient capacity at maximum firing rate to provide stoichiometric air for combustion plus 15% margin for safe combustion and control requirements. Static and total pressure capability will be coordinated with the requirements of the combustion air and boiler static pressure from fan inlet to stack outlet. The motor shall not be overloaded under any condition of operation. The fan shall be of rugged construction and dynamically balanced to prevent vibration. The fan wheel shall be backward inclined and direct connected to the correctly sized motor.

2.5 MAIN NATURAL GAS FUEL TRAIN

A. Natural Gas will be provided at minimum pressure of 5 psig and maximum pressure of 9 psig at the entrance to the fuel gas train.

B. A gas pressure regulator will be provided that is adequately sized for the available gas pressure and will be capable of accurately controlling gas pressure to the burner throughout the firing range.

C. High and low gas pressure manual reset gas pressure interlocks will be provided via the use of the burner controller and shall be logged by the burner management controller.

D. Two electrically operated gas shutdown valves with proof of closure switches and automatic vent valve will be provided to positively prevent gas from entering the burner in the event of the opening of any boiler or combustion system limit switch. Safety shut off valves will be interlocked with the flame safeguard control.

E. Gas trains will be designed to comply with UL/NFPA requirements as a minimum standard of acceptance. Manual shut off valves, leak test connections and pressure connections are to be provided in accordance with local code requirements.

2.6 PILOT GAS FUEL TRAIN

A. Natural Gas will be provided at pressure of 5 psig at the entrance to the pilot gas train.

B. A gas pressure regulator will be provided that is adequately sized for the available gas pressure and will be capable of controlling gas pressure to the burner for pilot gas.

C. Two electrically operated gas shutdown valves will be provided to positively prevent gas from entering the burner in the event of the opening of any boiler or combustion system limit switch. Safety shut off valves will be interlocked with the flame safeguard control.

D. Pilot gas trains will be designed to comply with UL/NFPA requirements as a minimum standard of acceptance. Manual shut-off valves are to be provided in accordance with local code requirements.

2.7 OIL FUEL TRAIN

A. Provide a burner mounted oil fuel train with two solenoid operated shut down valves to positively prevent oil from entering the burner in the event of the opening of any boiler or combustion system limit switch. NFPA approved safety shut off valves with proof of closure will be interlocked with the flame safeguard control.

B. A positive displacement oil pump mounted on the boiler skid will be provided for mechanical atomization of the oil. The oil pump set will be provided with a manual gate valve, fuel oil filter or strainer and pressure gauge on the pressure side of the oil pump. The oil pump must be capable of supplying the correct volume of oil at low and high fire to allow for spillback losses though the burner control valves maintaining a constant pressure at the oil nozzle regardless of firing input.

2.8 BURNER CONTROL PANEL

A. A NEMA 1 factory wired control cabinet will be supplied with each burner. The cabinet will be designed for mounting separate from the burner to meet site requirements. The control cabinet will house the Autoflame Mk 7 Micro Modulation fuel air ratio and flame safeguard control, 10.4" color touchscreen, water level controls, TDS/surface blowdown controls, expanded annunciator, programming purge timer, VFDs, fuses, relays, transformers, control switches and indicating lights. Panel will be provided with an air conditioning unit to cool and protect electrical components. Panel will be provided complete with the following features and functionality:

1. Individual lights with nameplates to indicate "Power On", "Fuel On", "Load Demand" and "Flame Failure".
2. The following control switches will be provided as a minimum. "On / Off", "Hand / Auto / Low Fire Hold", "Fuel Curve Select", "Reset", Flame Failure Reset" and "Manual Increase / Decrease firing rate push buttons".
3. All control and switchgear to safely operate the forced draft combustion fan, oil pump, run and fail indication lamps etc.
4. Pre-ignition purge airflow rate shall be no less than 100% of the maximum firing rate airflow. Micro processor interlocks shall be provided to continuously monitor and prove airflow at all times during purge cycles and operation.
5. Electronic safety control shall be interlocked with a scanner signal providing continuously monitored and verified flame signal intensity by detection of ultraviolet radiation.
6. The control panels will have installed Variable Speed Drives to control the forced draft fan to the burner. These will be monitored by a 4 – 20 mA input and output signal and checked continually and integrally by the "Micro Modulation Controller". Each VFD shall be rated for 115% of the full load amperage rating of the blower motor and will come with LCD panel display for ease of commissioning and fault finding while the control panel door is locked shut.
7. The front of the panel-mounted control will consist of a 10.4" touch screen providing easy to read numeric and system graphical information. Separate displays will be individually selectable for the specific application to provide continuously updated information as follows:
    a. Status Display - Fuel Fired, Percent Firing Rate, Required Temperature Actual Temperature, Hours Run and Installed Software Issue.
    b. Micro – Modulation - Degrees angular position of servo motors for Channels 1, 2, 3 and 4. Analogue input signals for channels 5 and 6. Designated O2 Trim Channel.
    c. Exhaust O2 analysis - On Line Values of O2, Exhaust Gas Temperature, Ambient Temperature, and Differential Temperature. The system will provide comparison of actual versus original commissioned values and will be displayed on demand locally and remotely.
    d. Sequencing Status - Boiler I.D number, Lead Boiler Designation, Reduced Set Point, Lag / Standby Firing Sequence and Current Boiler Status.
    e. Variable Speed - Vertical bar chart comparison display of analogue input and output from VFD on channels 5 and 6. Vertical bar chart display of percentage firing rate and comparison between commissioned and actual wind box air pressure.
    f. Flame Safeguard Graphical display of current Flame Safeguard Sequence Logic with indication of current status showing flame intensity signal strength for flame, post purge time and actual position in cycle, pre purge time and actual position in cycle, combustion air damper / VFD Speed Position, current firing rate status, main fuel valve status (Open or Closed), pilot fuel valve status (Open or Closed), spark ignition status, combustion air fan (Running or Standby), lockout or run status message, lockout reset capability
    g. Combustion Air Sensor - Combustion air proving pressure sensor is specified and must be installed allowing a graphical display to indicate commissioned and on line pressures.
    h. Lockout History - Display of the last annunciated 16 limit circuit lockouts with description of lockout, time and date occurred and reset time and date.

8. Oxygen Trim System- Provide a fully integrated system that will consist of a zirconium oxide probe

permanently installed in the boiler exhaust stack that will be data linked to the "Micro Modulation Controller" specified herein to continuously measure and display O2 percentage. The system will provide the necessary control signals via the "Micro Modulation Controller" to automatically adjust the air damper servo motor position and VFD ensuring that the commissioned values of O2 are maintained throughout the burner firing rate regardless of variations in stack pressure, fuel pressure boiler house temperature or barometric conditions.

9. Expansion Board Upgrade- to include the following features:

    a. First out annunciation to monitor thermostats and switches. Provide with 15 inputs in a series control circuit.
    b. Water level control via capacitance probes to measure and control the level switching points entered at commissioning. The provided probes will support 7 switch points (high level, 1st low level, 2nd low level, etc). The points will trigger feedwater activation, alarms and lockouts.
    c. TDS/Surface Blowdown control to drain boiler water at surface if/when total dissolved solids level falls out of range as measured by capacitance probe installed by boiler manufacturer.

2.9 BUILDING MANAGEMENT SYSTEM INTEGRATION

A. Provide a fully integrated "Data Transfer Interface (DTI)" with built in touchscreen. The DTI will be remote mounted and data linked to the "Micro Modulation Controller(s)" specified herein to continuously update, retrieve and make available for remote display and control the information stored in memory locally at the burner control panel as follows:
    1. Remote enable / disable control.
    2. Digital input / output signals via digital modules.
    3. Analogue input / output via analogue modules.
    4. Control relay status.
    5. Remote set point change.
    6. Hand and Low Fire Hold status.
    7. Lead boiler status.
    8. Remote lead boiler selection.
    9. On Line / Off Line status.
    10. Load index, firing rate in percentage.
    11. MM error numbers.
    12. Burner lockout details.
    13. O2 Trim
    14. Servomotor / Fuel and Air angular positions.
    15. Number of MM units on the system.
    16. Full lockout and lockout reset (time and date) history.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. The Owner or Owner's Representative may inspect the order execution and job progress at the manufacturer's facility during normal business hours at any point during the design, procurement, and fabrication processes. A minimum forty-eight hour notification is required prior to the inspection. All aspects of the job execution may be inspected except those data, information, or processes considered by the manufacturers to be proprietary.

3.2 INSTALLATION:

A. Critical boiler installation dimensions and considerations shall be incorporated into and supplied by the manufacturer on equipment general arrangement drawings. Manufacturer, upon notification of

discrepancies or errors by the job site or others, will correct such drawings, dimensions, and considerations in a timely fashion and re-submit to all concerned.

B. The Scotch Marine Packaged Firetube Boiler shall be designed to be installed on a 4" high concrete pad, 4" larger on each side than base of unit.

C. Boiler trim or other items “shipped loose” for field assembly shall be designated as “ship loose” on equipment bills of material and shippers packing documents.

D. Steam, fuel, and other connections: The location, size, and specifications for each applicable connection will be provided by the manufacturer’s supplied boiler Piping & Instrument Diagram, boiler general arrangement drawing, and bills of material.

D. Breeching: Manufacturer shall provide a fully flanged outlet connection for interface with the site supplied flue duct or stack equipment. Dimensions for the connection shall be provided in the boiler general arrangement drawing. The manufacturer will provide pertinent information delineating concerns, restrictions, or cautions associated with mating firetube boiler flue outlets with flue and stack systems not supplied by the boiler manufacturer.

F. Electrical: Electrical connection and service requirements shall be provided and clearly designated in the manufacturer’s electrical wiring diagrams.

3.3 FIELD QUALITY CONTROL:

A. The manufacturer will provide completed ASME P-2 forms to assist in completion by others of any required on-site hydrostatic testing or other testing in accordance with applicable sections of ASME Boiler and Pressure Vessel Code or other local codes.

B. Manufacturer will provide a written procedure by which any field defects or deficiencies will be brought to the manufacturer’s attention and by which the manufacturer will address such defects and deficiencies.

3.3 START-UP AND COMMISSIONING:

A. Equipment start-up and commissioning will be performed by a factory authorized technician and cost of services will be included in Contractor’s bid.

END OF SECTION 23 8100

SECTION 23 8200 – CONDENSATE SURGE UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Specifications, apply to this section.

B. Basic Mechanical Materials and Methods sections apply to this section when so designed in the applicable contract documents.

1.2 SUMMARY:

A. This specification applies to packaged, factory-assembled and tested, condensate surge tank, trim, and accessories.

1.3 SUBMITTALS:

A. Product Data - Manufacturer's technical data shall be presented prior to start of fabrication in an organized submittal and shall include the following:

1. Boiler:

a. Product General Arrangement Drawing.
b. Rated capacities of selected models.
c. Product dimensions including required clearances.
d. Unit weights (shipping and operating).

2. Controls, Trim, & Instrumentation:

a. Bills of Materials listing manufacturer, models, and quantity of supplied components.
b. Control Panel Layout Drawings.
c. Panel Controls and Indicators Layout Drawing.
d. Wiring schematics.

B. Operating & Maintenance Instructions - O & M manuals shall be compiled in an organized volume and submitted as a part of the original submittal. The manuals shall include the following:

1. Pre-commissioning installation, checks, and adjustment instructions.
2. Warranty information
3. Maintenance data for components and system.
4. Preventative maintenance schedules or recommendations.
5. Vendor data or "cut sheets" on major components.
6. General Arrangement Drawing.
7. Piping & Instrument Diagrams.
8. Control panel layout drawing.
9. Instrument & Electrical component bill of material.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications:

1. Manufacturer must be regularly engaged in the manufacture of similar equipment of types and capacities required with products satisfactorily used in similar service for not less than 10 years.
2. The manufacturer must have a written Quality Control manual and program which is currently maintained.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Critical envelope dimensions of surge tank shall be provided to allow review for clearances prior to transport or insertion into restricted spaces.

B. Exposed electrical components that may be subject to transportation damage due to ambient exposure shall be wrapped and isolated with appropriate elastomer or weatherproofing material at the factory.

C. Exposed physical utility connections (flanges, pipe ends, etc.) shall be isolated for transport from ambient influences with appropriate blinds, caps, or weatherproofing materials.

D. Manufacturer shall provide lifting lugs at points of crane or lift attachment. Lifting load (weight) shall be provided by the manufacturer.

E. Water shall be drained from all water storage areas, piping systems, valves, and components prior to shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Approved packaged surge tank manufacturers must be subject to and in compliance with this specification and other applicable contract requirements. Approved manufacturers include the following:

BSF
Cleaver Brooks
Only other pre approved equivalent that is listed by subsequent addendum

2.2 PACKAGED SURGE TANK

A. Provide, where indicated on drawings and as defined by the schedule on the plans, a packaged condensate surge unit complete with stainless steel receiver tank, pumps, piping, trim valves, control panel all mounted on a structural steel support stand.

B. Surge Tank Level shall be monitored by a unit mounted PLC with HMI display. Level shall be controlled via a PID control loop that modulates a control valve to maintain the level to a setpoint. Setpoint shall be entered and displayed HMI. Process and Control Variables shall also be displayed on the HMI.

C. The PLC will include low level alarm, low level shutdown switch, high level alarm and high level shutdown Switch. If either the low level shutdown or high level shutdown switch is triggered, an alarm message with an audible alert will be activated. In the event of a high level shutdown, the water flow to the tank will be isloated. In the event of a low water shutdown the pumps will be shut off.

D. Three pumps will deliver water from the surge tank to the deaerator. Pumps shall be controlled via the PLC and monitored at the HMI. Pumps shall operate using a Lead / Lag / Standby sequence. Each pump shall be configured as Lead, Lag, or Standby. Individual pump pressure and Lead / Lag / Standby status is to be monitored by the PLC and displayed at the HMI.

E. A PID instruction in the PLC will control water flow using a setpoint that is displayed and can be adjusted at the HMI. The control variable will be used to control automatic pump sequencing. The Lag Pump will start if the Lead Pump cannot maintain pressure based upon the PID Control Variable and Setpoints that are entered and displayed at the HMI. The Standby Pump should not be required to run at the same time as both the Lead and Lag Pumps. However, if both the Lead and Lag Pumps are running, the Standby Pump will start and stop based upon the PID Control Variable and Setpoints that are entered and displayed at the HMI.

F. Each pump will include a retentive run timer that will allow the operator to view run time of each pump. This is to allow the operator to change Lead, Lag, and Standby status based on run time. The HMI will include a button to reset the run timers.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. The Owner or Owner's Representative may inspect the order execution and job progress at the manufacturer's facility during normal business hours at any point during the design, procurement, and fabrication processes. A minimum forty-eight hour notification is required prior to the inspection. All aspects of the job execution may be inspected except those data, information, or processes considered by the manufacturers to be proprietary.

3.2 INSTALLATION:

A. Critical installation dimensions and considerations shall be incorporated into and supplied by the manufacturer on equipment general arrangement drawings. Manufacturer, upon notification of discrepancies or errors by the job site or others, will correct such drawings, dimensions, and considerations in a timely fashion and re-submit to all concerned.

B. The surge tank shall be designed to be installed on a 4" high concrete pad, 4" larger on each side than base of unit.

C. Surge tank trim or other items "shipped loose" for field assembly shall be designated as "ship loose" on equipment bills of material and shippers packing documents.

D. The location, size, and specifications for each applicable connection will be provided by the manufacturer's supplied Piping & Instrument Diagram, general arrangement drawing, and bills of material.

E. Electrical: Electrical connection and service requirements shall be provided and clearly designated in the manufacturer's electrical wiring diagrams.

3.3 FIELD QUALITY CONTROL:

A. The manufacturer will provide completed forms to assist in completion by others of any required on-site hydrostatic testing or other testing in accordance with applicable sections of ASME Boiler and Pressure Vessel Code or other local codes.

B. Manufacturer will provide a written procedure by which any field defects or deficiencies will be brought to the manufacturer's attention and by which the manufacturer will address such defects and deficiencies.

3.4 START-UP AND COMMISSIONING:

A. Equipment start-up and commissioning will be performed by a factory authorized technician and cost of services will be included in Contractor's bid.

END OF SECTION 23 8200

SECTION 23 8300 – DEAERATOR BOILER FEEDWATER UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Specifications, apply to this section.

B. Basic Mechanical Materials and Methods sections apply to this section when so designed in the applicable contract documents.

1.2 SUMMARY:

A. This specification applies to packaged, factory-assembled and tested, spray type deaerator boiler feedwater unit complete with trim, pumps, and accessories.

1.3 SUBMITTALS:

A. Product Data - Manufacturer's technical data shall be presented prior to start of fabrication in an organized submittal and shall include the following:

1. Deaerator:

a. Product General Arrangement Drawing.
b. Rated capacities of selected models.
c. Product dimensions including required clearances.
d. Unit weights (shipping and operating).

2. Controls, Trim, & Instrumentation:

a. Bills of Materials listing manufacturer, models, and quantity of supplied components.
b. Control Panel Layout Drawings.
c. Panel Controls and Indicators Layout Drawing.
d. Wiring schematics.

B. Operating & Maintenance Instructions - O & M manuals shall be compiled in an organized volume and submitted as a part of the original submittal. The manuals shall include the following:

1. Pre-commissioning installation, checks, and adjustment instructions.
2. Warranty information
3. Maintenance data for components and system.
4. Preventative maintenance schedules or recommendations.
5. Vendor data or "cut sheets" on major components.
6. General Arrangement Drawing.
7. Piping & Instrument Diagrams.
8. Control panel layout drawing.
9. Instrument & Electrical component bill of material.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications:

1. Manufacturer must be regularly engaged in the manufacture of similar equipment of types and capacities required with products satisfactorily used in similar service for not less than 10 years.

2. The manufacturer must have a written Quality Control manual and program which is currently maintained.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Critical envelope dimensions of surge tank shall be provided to allow review for clearances prior to transport or insertion into restricted spaces.

B. Exposed electrical components that may be subject to transportation damage due to ambient exposure shall be wrapped and isolated with appropriate elastomer or weatherproofing material at the factory.

C. Exposed physical utility connections (flanges, pipe ends, etc.) shall be isolated for transport from ambient influences with appropriate blinds, caps, or weatherproofing materials.

D. Manufacturer shall provide lifting lugs at points of crane or lift attachment. Lifting load (weight) shall be provided by the manufacturer.

E. Water shall be drained from all water storage areas, piping systems, valves, and components prior to shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Approved packaged surge tank manufacturers must be subject to and in compliance with this specification and other applicable contract requirements. Approved manufacturers include the following:

BSF
Cleaver Brooks
Only other pre approved equivalent that is listed by subsequent addendum

2.2 PACKAGED DEAERATOR

A. Provide, where indicated on drawings and as defined by the schedule on the plans, a packaged spray type deaerator boiler feedwater unit complete with steel receiver tank, boiler feed pumps, piping, trim valves, control panel all mounted on a structural steel support stand.

B. DA Tank Level shall be monitored by a unit mounted PLC with HMI display. Level shall be controlled via a PID control loop that modulates a control valve to maintain the level to a setpoint. Setpoint shall be entered and displayed HMI. Process and Control Variables shall also be displayed on the HMI.

C. The PLC will include low level alarm, low level shutdown switch, high level alarm and high level shutdown Switch. If either the low level shutdown or high level shutdown switch is triggered, an alarm message with an audible alert will be activated. In the event of a high level shutdown, the water flow to the tank will be isloated. In the event of a low water shutdown the pumps will be shut off.

D. Four pumps will deliver water from the DA tank to the boilers. Pumps shall be controlled via the PLC and monitored at the HMI. Pumps shall operate using a Lead / Lag / Standby1 / Standby 2 sequence. Each pump shall be configured as Lead, Lag, Standby 1 or Standby 2. Individual pump pressure and Lead / Lag / Standby status is to be monitored by the PLC and displayed at the HMI.

E. A PID instruction in the PLC will control water flow using a setpoint that is displayed and can be adjusted at the HMI. The control variable will be used to control automatic pump sequencing.

The Lag Pump will start if the Lead Pump cannot maintain pressure based upon the PID Control Variable and Setpoints that are entered and displayed at the HMI. The Standby Pump should not be required to run at the same time as both the Lead and Lag Pumps. However, if both the Lead and Lag Pumps are running, the Standby Pump will start and stop based upon the PID Control Variable and Setpoints that are entered and displayed at the HMI.

F. Each pump will include a retentive run timer that will allow the operator to view run time of each pump. This is to allow the operator to change Lead, Lag, and Standby status based on run time. The HMI will include a button to reset the run timers.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. The Owner or Owner's Representative may inspect the order execution and job progress at the manufacturer's facility during normal business hours at any point during the design, procurement, and fabrication processes. A minimum forty-eight hour notification is required prior to the inspection. All aspects of the job execution may be inspected except those data, information, or processes considered by the manufacturers to be proprietary.

3.2 INSTALLATION:

A. Critical installation dimensions and considerations shall be incorporated into and supplied by the manufacturer on equipment general arrangement drawings. Manufacturer, upon notification of discrepancies or errors by the job site or others, will correct such drawings, dimensions, and considerations in a timely fashion and re-submit to all concerned.

B. The surge tank shall be designed to be installed on a 4" high concrete pad, 4" larger on each side than base of unit.

C. Surge tank trim or other items "shipped loose" for field assembly shall be designated as "ship loose" on equipment bills of material and shippers packing documents.

D. The location, size, and specifications for each applicable connection will be provided by the manufacturer's supplied Piping & Instrument Diagram, general arrangement drawing, and bills of material.

E. Electrical: Electrical connection and service requirements shall be provided and clearly designated in the manufacturer's electrical wiring diagrams.

3.3 FIELD QUALITY CONTROL:

A. The manufacturer will provide completed forms to assist in completion by others of any required on-site hydrostatic testing or other testing in accordance with applicable sections of ASME Boiler and Pressure Vessel Code or other local codes.

B. Manufacturer will provide a written procedure by which any field defects or deficiencies will be brought to the manufacturer's attention and by which the manufacturer will address such defects and deficiencies.

3.3 START-UP AND COMMISSIONING:

A. Equipment start-up and commissioning will be performed by a factory authorized technician and cost of services will be included in Contractor's bid.

END OF SECTION 23 8300

SECTION 23 8400 – HVAC WATER TREATMENT

PART 1 - GENERAL (Reference Section 230500)

1.1 CHILLED WATER AND STEAM SYSTEM CHEMICAL TREATMENT

A. Chemical treatment shall be provided for the steam system and condenser water system thru the use of the new chemical injection equipment as indicated on the plans.

B. Chemical treatment shall be provided for the closed loop chilled water system and the closed loop hot water system using “pot feeders” as indicated on the plans.

C. The Contractor shall be responsible to provide appropriate chemical treatment throughout the duration of construction. Upon completion of construction, the Owner will take over the chemical treatment program.

D. The Contractor shall be responsible to coordinate system shutdowns and startups with chemical treatment personnel to allow for proper treatment of the systems.

E. The existing chemical treatment contractor, currently utilized by the State of Kansas for their current main steam plant, shall be responsible to provide all equipment, as indicated on the plans, and all additional chemical for the proper treatment of the systems as required by this project. Coordinate with the Owner and include, in the base bid, all costs associated with equipment and chemicals for proper system treatment

F. The Contractor shall properly clean and flush all systems and associated equipment once all new system components have been installed. Procedures for cleaning and flushing shall be provided by the chemical treatment provider. The Contractor shall implicitly follow the direction of chemical treatment provider so as to properly clean out and flush the systems and equipment.

G. The chemical treatment provider is:

Wade Hutcheson
14006 S Cottonwood Drive

Olathe, KS 66062

Office: (763) 689-3636 extension 328
Mobile: (913) 375-6373
whutcheson@uswaterservices.com

END OF SECTION 23 8400

SECTION 23 8500 - WATER CHILLERS

PART 1 - GENERAL (Reference Section 230500)

1.1 Install where indicated on drawings, water cooled chillers as indicated on drawings.

A. Two chillers shall be removed from the Docking State Office Building and transported to and installed in the new Kansas Energy Center and one chiller shall be removed from the Eisenhower State Office Building and transported to and installed in the new Kansas Energy Center.

B. The Contractor shall coordinate efforts with the Owner's maintenance staff to disconnect, protect, transport and place these existing chillers.

1.2 SUBMITTALS

A. Submit manufacturer's installation instructions.

1.3 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include start-up instructions, maintenance data, controls, and accessories.

1.4 STORAGE AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage. Factory coil shipping covers shall be kept in place until installation.

C. Unit controls shall be capable of withstanding 203 Deg F (95 Deg C) storage temperatures in the control compartment for an indefinite period of time.

PART 2 – PRODUCTS – Not Applicable

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Align chiller package on concrete foundations.

C. Install units on neoprene vibration isolators.

D. Connect to electrical service.

E. Connect to chilled water piping.

F. Arrange piping for easy dismantling to permit tube cleaning.

3.2 MANUFACTURER'S FIELD SERVICES

A. Supply service of factory trained representative for a period of one day to supervise testing, start-up, and instruction on operation and maintenance to Owner.

B. Owner instruction by factory-trained representative shall be professionally video taped in digital format. Training video recording shall be submitted to and become the property of the Owner.

C. Supply charge of refrigerant R 134a and oil as required to assure each chiller is fully charged..

END OF SECTION 23 8500

SECTION 23 9100 – HVAC INSTRUMENTATION AND CONTROLS

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.

B. System commissioning is a part of the construction process. Documentation and testing of systems, as well as training of the Owner's operation and maintenance personnel, is required. Final Completion is dependent on successful completion of all commissioning procedures, documentation, and issue closure.

1.2 DEFINITIONS

A. ACP: Area Control Panel.

B. DDC: Direct-digital controls.

C. LAN: Local area network.

D. MS/TP: Master-slave/token-passing.

E. PICS: Protocol Implementation Conformance Statement.

F. PC: Personal Computer.

G. BIBBS: BACnet Interoperability Building Blocks.

H. TCP/IP: Transmission Control Protocol/Internet Protocol.

I. EMCS: Energy Management Control System.

J. RCAS: Reserve Component Automation System.

1.3 SYSTEM DESCRIPTION

A. Provide additions to the existing Control Systems as indicated on plans. These additions shall be by Johnson Controls, and shall be acquired via the existing State contract that the Capitol Complex has with Johnson Controls, State contract #33634. Johnson Controls will contract directly with the Capitol Complex for the required Building Automation and Control Systems modifications, and will not flow through the General and Mechanical Contracts. The General and Mechanical Contractors will be required to coordinate with Johnson Controls on this project. The system s hall be complete in all respects including labor, materials, equipment, and services necessary, and shall be installed by personnel regularly employed by Johnson Controls.

B. All automation and control components shall be integrated into a distributed network system communicating over a nonproprietary local area network. This system shall consist of field Stand-alone Direct Digital Controllers (DDC), Smart Local DDC's and interface into existing PC based operator workstations.

1.4 SEQUENCE OF OPERATION (SEE PLANS)

1.5 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. Each control device labeled with setting or adjustable range of control.

B. Shop Drawings: Detail equipment assemblies for each DDC and/or pneumatic control system and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices. Included shall be diagrams depicting the system architecture complete with a communications riser.
2. Wiring Diagrams: Power, signal, and point-to-point control wiring diagrams. Differentiate between manufacturer-installed and field-installed wiring.
3. Details of control panel faces, including controls, instruments, and labeling.
4. Written description of sequence of operation.
5. Schedule of dampers including size, leakage, and flow characteristics.
6. Schedule of valves including leakage and flow characteristics.
7. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
8. Listing of connected data points, including connected control unit and input device.
9. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
10. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

C. ANSI/ASHRAE 135 BACnet Statement: PICS for each DDC system component (panel, zone controller (at VAV terminals), field devices, and operator workstation) proposed.

D. Samples: For each color required, of each type of thermostat cover.

E. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems. All software shall be licensed in the name of the Owner.

F. Software Upgrade Kit: For Authorized Representative to use in modifying software to suit future power system revisions or monitoring and control revisions.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

H. Maintenance Data: For systems to include in maintenance manuals specified in Division 1. Include the following:

1. Maintenance instructions and lists of spare parts for each type of control device.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.

4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

I. Qualification Data: For firms and persons specified in “Quality Assurance” Article.

J. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is a certified installer of the BAS control system manufacturer for both installation and maintenance of units required for this Project and shall include all necessary debugging and calibration of each component of the system.

B. Manufacturer Qualifications: A firm experienced in manufacturing automatic temperature-control systems similar to those indicated for this Project and with a record of successful in-service performance. Equipment and Installer shall have a support facility within 100 miles of the site with technical support staff, spare parts inventory and all necessary test and diagnostic equipment.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Underwriters Laboratory (UL 916).

E. FCC Regulation, Part 15, Section 156.

F. National Electric Manufacturers Associations (NEMA).

G. Building Officials and Code Administrator’s International (BOCA) Mechanical Code.

H. Comply with NFPA 90A, “Installation of Air Conditioning and Ventilation Systems.”

I. Comply with ASHRAE 135 for DDC system control components.

J. Year-2000 Compliant: Computer hardware and software shall be capable of accurately processing, providing, and receiving date data from, into, and between the twentieth and twenty-first centuries, including leap-year calculations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.8 COORDINATION

A. Coordinate location of thermostats, and other exposed control sensors with plans and room details before installation.

B. Coordinate supply of conditioned electrical circuits for control units and operator workstation.

1.9 WORK BY OTHERS

A. Contractor Responsibilities/Coordination with building Automation and Control System Contractor. It shall be the responsibility of the General, Mechanical, and Electrical Contractors to coordinate with the Capitol Complex BACS contractor, Johnson Control, to procure a fully functional mechanical system. Responsibilities of the Contractors are as follows:

B. Sheet Metal Subcontractor:

1. Setting of automatic control dampers, and blank off plates.
2. Access doors where and as required.
3. Provide necessary mechanical equipment submittals to Johnson Controls.

C. Piping Contractor:

1. Installation of immersion wells.
2. Installation of flow switches.
3. Setting of automatic control valves.
4. Installation of pressure tappings and associated shut-off cocks.
5. Provide necessary mechanical equipment submittals to Johnson Controls.

D. Electrical Contractor:

1. All power wiring and line voltage interlock wiring such as exhaust fan interlocked to supply fan.
2. All control wiring specifically shown on electric plans, such as unit heater room thermostats.
3. Provide submittal drawings to the BACS contractor on any items that will require and interface between the two.

E. Electrical Work for Controls:

1. All electrical work for automatic controls, except as otherwise specified, or shown on the electrical drawings shall be included in this Division by Johnson Controls.
2. Electrical work shall, in general, comply with the following:

a. All low voltage wiring in finished rooms shall be concealed below working heights and exposed above.
b. Electrical work may include both line voltage and low voltage wiring, as required.
c. Conduit network from power systems may be used for running control high voltage wiring.
d. All electrical work shall comply with the NEC and the local electrical codes.
e. All safety devices shall be wired through both hand and auto positions of motor starting device to insure 100% safety shut-off.
f. All magnetic starters furnished by Electrical Contractor for mechanical equipment shall be furnished with integral control transformers, sized to handle the additional VA needed for the controls – pilots, EP valves, etc.
g. The motor starter supplier shall provide auxiliary contacts as required for interlock by BACS Contractor, the supplier shall estimate an allowance of at least one auxiliary contract per starter. All interlock and control wiring shown on the electrical prints is by the electrical subcontractor.

1.10 GUARANTEE

A. All components, parts and assemblies shall be guaranteed against defects in material and workmanship for a period of one year after acceptance. Expressed warranties are conditionally based on the requirement that the items covered within the guarantee are used and maintained in accordance with the manufacturer's recommendations. Guarantee commences at the time of

acceptance and continues for the previously indicated duration. Individual or aggregate beneficial use shall bean that the Owner's operators are able to use the System and receive reliable information from inputs and outputs completed by the Building Automation Contractor.

B. The following procedures shall govern the guarantee period. Within thirty (30) days after the Owner is receiving beneficial use of approved operation, the Building Automation Contractor shall initiate the guarantee period by formally transmitting to the Owner commencement notification of the period of the system(s), subsystem(s) and devices previously accepted. Guarantee notification will be formally transmitted in like manner for subsequent phases or portions thereof which remain incomplete at the time of initial notification.

1.11 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Replacement Materials: One replacement diaphragm or relay mechanism for each unique valve motor, controller, thermostat and positioning relay.

C. Spare points on individual controllers will not be required; however, the entire system must have the ability to be expanded in the future through the addition of application specific controllers.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide products compatible with existing automatic temperature controls and as required for a complete and functional system as indicated on plans.

2.2 STATUS AND SAFETY SWITCHES

A. General Requirements

1. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the FMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.

B. Current Sensing Switches

1. The current sensing switch shall be self-powered with solid state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
2. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
3. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.

C. Air Flow Switches

1. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.

2.3 HVAC OUTPUT DEVICES

A. Actuators

1. General Requirements

a. Damper and valve actuators shall be electronic.

2. Electronic Damper Actuators

a. Electronic damper actuators shall be direct shaft mount.
b. Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized based on actuator manufacturer's recommendations for face velocity, differential pressure and damper type. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. All actuators shall have external adjustable stops to limit the travel in either direction, and a gear release to allow manual positioning.
c. Modulating actuators shall accept 24 VAC or VDC power supply, consume no more than 15 VA, and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
d. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop associated fan. Two-position actuators, as specified in sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.
e. Acceptable manufacturers: Johnson Controls, Belimo

3. Electronic Valve Actuators

a. Electronic valve actuators shall be manufactured by the valve manufacturer.
b. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.
c. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the sequence of operations. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.
d. Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.

e. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.

B. Control Dampers

1. The FMS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the FMS Contractor or as specifically indicated on the Drawings.
2. All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.
3. All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.
4. Damper frames and blades shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 48". Damper blades shall be 16-gauge minimum and shall not exceed six (6) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. Additional stiffening or bracing shall be provided for any section exceeding 48" in height. All damper bearings shall be made of stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48" x 48" size shall not leak in excess of 8.5 cfm per square foot when closed against 4" w.g. static pressure when tested in accordance with AMCA Std. 500.
5. Air foil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5" w.g., but no more than 4000 FPM or 6" w.g. Acceptable manufacturers are Johnson Controls D-1300, Ruskin CD50, and Vent Products 5650.
6. One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below.
7. Acceptable manufacturers are: Johnson Controls D-1100, Ruskin CD36, and Vent Products 5800.
8. Multiple section dampers may be jack-shafted to allow mounting of direct connect electronic actuators. Each end of the jack shaft shall receive at least one actuator to reduce jack shaft twist.

C. Control Relays

1. Control Pilot Relays

a. Control pilot relays shall be of a modular plug-in design with retaining springs or clips.
b. Mounting bases shall be snap-mount.
c. DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.
d. Contacts shall be rated for 10 amps at 120VAC.
e. Relays shall have an integral indicator light and check button.
f. Acceptable manufacturers: Johnson Controls, Lectro

D. Control Valves

1. All automatic control valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating and cooling loads, as specified. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved. Body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule elsewhere in this Specification.

2. Chilled water control valves shall be modulating plug, ball, and/or butterfly, as required by the specific application. Modulating water valves shall be sized per manufacturer's recommendations for the given application. In general, valves (2 or 3-way) serving variable flow air handling unit coils shall be sized for a pressure drop equal to the actual coil pressure drop, but no less than 5 PSI.
3. Modulating plug water valves of the single-seat type with equal percentage flow characteristics shall be used for all hot and chilled water applications, except those described hereinafter. The valve discs shall be composition type. Valve stems shall be stainless steel.
4. Ball or Globe valves shall be acceptable for water terminal reheat coils, radiant panels, unit heaters, package air conditioning units, and fan coil units.

    a. Globe Valves NPS 2 and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity replaceable under pressure.
    b. Globe Valves NPS 2 ½" and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc
    c. Hydronic system globe valves shall have the following characteristics:

        1) Rating: Class 125 for service at 125 psig and 250 degrees F operating conditions.
        2) Internal Construction: Replaceable plugs and seats of stainless steel or brass. Single-seated valves with cage trim provides seating and guiding surfaces for plug on top and bottom of guide plugs. Double-seated valves with balancing plug; caged trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.

    d. Sizing: 3-psig maximum pressure drop at design flow rate.
    e. Flow characteristics: Two-way valves shall have equal percentage characteristics. Operators shall close valves against pump shutoff head.

E. Electronic Signal Isolation Transducers

1. A signal isolation transducer shall be provided whenever an analog output signal from the Facility Management System is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.
2. The signal isolation transducer shall provide ground plane isolation between systems.
3. Signals shall provide optical isolation between systems.

2.4 HVAC MISCELLANEOUS DEVICES

A. Local Control Panels

1. All control panels shall be factory constructed, incorporating the FMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with sub-panel, hinged door, and key-locking latch.
2. In general, the control panels shall consist of the DDC controller(s), display module, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. The display module shall be flush mounted in the panel face unless otherwise noted.
3. All I/O connections on the DDC controller shall be extended to a numbered, color-coded, and labeled terminal strip for ease of maintenance and expansion. Wiring to I/O devices shall be made from this terminal strip.
4. All other wiring in the panel, internal and external, shall be made to additional line or low voltage color-coded and labeled terminal strips. Low and line voltage wiring shall be segregated. All terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.

5. All wiring for every control panel shall follow a common color-coded format. All terminal strip color coding and numbering shall follow a common format. All wiring shall be neatly installed in plastic trays or tie-wrapped.
6. A convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers.

B. Power Supplies

1. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.
2. Input: 120 VAC +10%, 60Hz.
3. Output: 24 VDC.
4. Line Regulation: +0.05% for 10% line change.
5. Load Regulation: +0.05% for 50% load change.
6. Ripple and Noise: 1 mV rms, 5 mV peak to peak.
7. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.
8. A power disconnect switch shall be provided next to the power supply.

C. Thermostats

1. Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be manufacturer's standard finish.

2.5 CONTROL CABLE

A. Electronic and Fiber-Optic Cable for Control Wiring: As specified in Division 16 Section "Control/Signal Transmission Media."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation.

B. Verify that duct-, pipe-, and equipment-mounted devices and wiring and pneumatic piping are installed before proceeding with installation.

3.2 INSTALLATION

A. Install equipment level and plumb.

B. Install software in control units and operator workstation. Implement all features of programs to specified requirements and as appropriate to sequence of operation.

C. Connect and configure equipment and software to achieve sequence of operation specified.

D. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate all 60 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

E. Install guards on thermostats in the following locations:

1. Entrances.

2. Public areas.
3. Where indicated.

F. Install automatic dampers according to Section 15820 “Duct Accessories.”

G. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

H. Install labels and nameplates to identify control components according to Section 15050 “Basic Mechanical Materials and Methods.”

I. Install labels and nameplates to identify control components according to Section 15075 “Mechanical Identification.”

J. Install hydronic instrument wells, valves, and other accessories according to Section 15181 “Hydronic Piping.”

K. Install duct volume-control dampers according to Division 15 Sections specifying air ducts.

L. Install electronic and fiber-optic cables according to Division 16 Section “Control/Signal Transmission Media.”

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 16 Section “Raceways and Boxes.”

B. Install building wire and cable according to Division 16 Section “Conductors and Cables.”

C. Install signal and communication cable according to Division 16 Section “Control/Signal Transmission Media.”

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

D. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Install piping adjacent to machine to allow service and maintenance.

B. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
3. Calibration test electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Engage a factory-authorized service representative to perform startup service.

C. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust control systems.
2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

D. Verify DDC as follows:

1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.
2. Verify operation of operator workstation.
3. Verify local control units including self-diagnostics.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Authorized Representative's maintenance personnel to adjust, operate, and maintain control systems and components.

1. Train Authorized Representative's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs. Include a minimum of 24 hours' dedicated instructor time on-site.
3. Review data in maintenance manuals. Refer to Section 01770 "Project Closeout."
4. Schedule training with Authorized Representative, through Architect, with at least seven days' advance notice.
5. Training of the Owner's operation and maintenance personnel is required in cooperation with the Commissioning Consultant. A training agenda shall be prepared by the Contractor and approved by the Commissioning Consultant prior to training performance.

3.7 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested by Authorized Representative, to adjust and calibrate components and to assist Authorized Representative's personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

END OF SECTION 23 9100

SECTION 23 9500 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL (REFERENCE SECTION 230500)

1.1 TESTING AND BALANCING

A. Testing and balancing of the HVAC air and hydronic systems will be completed near the end of construction. The Subcontractor has responsibility to cooperate with, make adjustments for, and provide any equipment necessary for the TAB agency to complete the job. Include all testing and balancing costs in the Contractor's bid.

1.2 ACCEPTABLE TESTING AND BALANCING FIRMS:

Energy Management & Control Corporation
3639 SW Summerfield Dr. Suite B
(785) 233-0289

Allied Labs
303 S. Topeka
Wichita, KS 67202
(316) 262-6457

Doyle Field Services, Inc.
646 W. 58th St.
Kansas City, MO 64113
(816) 444-7103

ViroCon
1627 Main St. Suite 600
Kansas City, MO 64108
(816) 842-9225

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 SYSTEM PREPARATION FOR TESTING AND BALANCING

A. Prior to requesting testing and balancing agency to perform their work the installing Subcontractor shall make all necessary inspections and adjustments to insure that systems are completely installed and operating in accordance with the manufacturer's recommendations and the contract documents.

B. The following checks shall be performed on each system installed under this contract. A report sheet shall be prepared by the testing and balancing firm for each system indicating checks made, corrective action taken where required, date, and name of person making inspection. Submit two copies of the checklist to the A/E.

1. Air Handling Systems:

a. Clear system of all foreign objects & clean system.
b. Verify fan rotation.
c. Check bearing condition and lubrication.
d. Check fan wheel clearances & fan alignment.
e. Check motor security to mounting base.
f. Check alignment of drive.

g. Check vibration isolator adjustment.
h. Verify that proper filter media is installed.
i. Verify that all control dampers are installed and operable without binding or sticking.
j. Confirm that all fire, smoke and volume dampers are installed and in full open position.
k. Verify that all air terminal units are installed.
l. Confirm that all air openings in walls above ceilings have been provided.
m. Check for and repair all excessive air leaks in duct systems, at equipment connections and at coils. Air leaks shall not exceed SMACNA parameters for system pressure.
n. Verify that ductwork is constructed and installed in accordance with contract drawings and/or approved ductwork shop drawings.

2. Hydronic Systems:

a. Confirm that total system has been hydrostatically tested, flushed, filled, vented and water treated as required.
b. Confirm that all strainer baskets are in place, clean and are the proper type.
c. Verify that all pressure reducing and control valves are operating properly.
d. Verify that access to all balancing valves and flow stations in walls and ceilings have been provided.
e. Confirm that fittings have been provided for flow and temperature measurements at all coils, heat exchangers and pumps.

3.2 COORDINATION & RESPONSIBILITIES

A. Attend initial Construction meeting scheduled by the Commissioning Agent and all other construction meetings as necessary.

B. Submit the draft and final TAB procedures and all proposed test forms to the design professional for review and acceptance.

C. Attend any construction meetings scheduled by the design professional. Be prepared to discuss the procedures that shall be followed in testing, adjusting and balancing the HVAC system.

D. Notify the Engineer a minimum of (2) two weeks in advance of the time for start of the TAB work.

E. Begin TAB work only after Pre-Functional Procedures, leak testing, start-up, etc. have been completed, documented, reviewed and approved.

F. Work with the Owner to assist in properly calibrating the system.

G. Provide Engineer with copies of in-progress, hand-written reports of TAB work, when requested on a regular basis.

3.3 AIR BALANCE

A. The Contractor shall procure the services of the independent air balance and testing agency, approved by the Engineer, which specializes in the balancing and testing of heating, ventilating and air conditioning systems, to balance, adjust, and test air moving equipment and air distribution and exhaust systems and all water flow circuits. All work by this agency shall be done under direct supervision of a qualified heating and ventilating engineer employed by them. All instruments used by this agency shall be accurately calibrated within six months of performing work and maintained in good working order. If requested the tests shall be conducted in the presence of the Engineer responsible for the project and/or its representative. The testing and

balancing firm shall be certified by NEBB or AABC and all work shall be performed in accordance with these organizations' published procedure manuals.

B. Air balance and testing shall not begin until systems have been completed and are in full working order. All heating, ventilation, and air conditioning systems and equipment shall be in full operation during each working day of testing and balancing.

C. The Subcontractor shall make changes in pulleys, belts, dampers, etc., as required by the test and balance agency, at no additional cost to the Owner.

D. The Subcontractor shall install new filters in the air handlers and clean all strainers in the water system just prior to the beginning of the testing and balancing.

E. The control manufacturer or its representative shall assist the test and balance agency in setting automatic dampers, valves, etc., as required.

F. The air flows shall be balanced to within ± 10% of design requirements.

3.4 WATER BALANCE

A. The Contractor shall procure the services of the independent air balance and testing agency, approved by the Engineer, which specializes in the balancing and testing of heating, ventilating and air conditioning systems, to balance, adjust, and test all new pumping equipment. All work by this agency shall be done under direct supervision of a qualified heating and ventilating engineer employed by them. All instruments used by this agency shall be accurately calibrated within six months of performing work and maintained in good working order. If requested the tests shall be conducted in the presence of the Engineer responsible for the project and/or its representative. The testing and balancing firm shall be certified by NEBB or AABC and all work shall be performed in accordance with these organizations' published procedure manuals.

B. During installation of the mechanical systems the testing and balancing agency shall make no less than (1) inspection visits to the project site. Proper placement and installation of all control and balancing devices shall be verified by these inspections. The mechanical contractor shall make all corrections in control and balancing device locations as requested by the TAB firm. Following each inspection visit the TAB firm shall report to the A/E all items noted, action taken, and progress of control device installation. The last inspection and balancing shall be performed in the presence of a professional engineer active in the design of mechanical building systems.

3.5 REPORT

A. The balancing agency shall prepare a certified report of all tests performed. The report shall be written on standard forms prepared by NEBB or AABC or facsimiles thereof. The balancing agency shall submit the report electronically to the Engineer. A hard copy of the report, subsequent to approval by the Engineer, shall be included in each of the Operating and Maintenance manuals for the project.

B. The Balancing reports shall include a line drawing of each HVAC air handling, exhaust and hydronic system the heating water piping as installed; record of all air handling unit, exhaust fan and pump data at idle and full load conditions, air and water flows, and air and water temperatures. The balancing report shall also include all NEBB or AABC forms completed as required by each respective certification.

END OF SECTION 23 9500

SECTION 26 0500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications preceding this division of this specification are applicable to contractors, subcontractors, and material suppliers.

1.2 SPECIFICATION FORM AND DEFINITION

A. These Specifications are abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "shall be", "as noted on the drawings", "according to the drawings", "a", "an", "the" and "all" are intentional. Omitted words and phrases shall be supplied by inference.

B. Engineer, wherever used in these specifications shall mean LATIMER, SOMMERS & ASSOCIATES, P.A., 3639 SW SUMMERFIELD DRIVE, SUITE A, TOPEKA, KANSAS 66614, 785-233-3232, FAX 785-233-0647.

C. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with Owner to perform this work.

D. When a word, such as "proper", "satisfactory" and "as directed" is used, it required Engineer's review.

E. "Provide" means furnish and install.

F. Engineer hereinafter abbreviated ENGINEER shall mean both the Design Engineers and the Design Engineers.

G. Equipment and/or materials manufacturer hereinafter abbreviated E/M shall mean the manufacturer of equipment or materials specified or referred to.

H. When the term “equivalent” is used in context to products or manufacturer’s, the equivalency of the proposed product or manufacturer to be used in lieu of the specified product or manufacturer is the sole decision of the ENGINEER.

1.3 QUALIFICATIONS

A. The contractor responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractor shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractor shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.4 LOCAL CONDITIONS

A. Visit site and determine existing local conditions affecting work in contract.

B. Failure to determine site conditions or nature of existing or new construction will not be considered basis for granting additional compensation.

1.5 CONTRACT CHANGES

A. Changes or deviations from contract, including those for extra or additional work must be submitted in writing for review of Engineer. No verbal orders will be recognized.

1.6 LOCATIONS AND INTERFERENCES

A. Locations of equipment, conduit and other electrical work are indicated diagrammatically by electrical drawings. Layout work from dimensions on Engineerural and Structural Drawings. Verify equipment size from manufacturers shop drawings.

B. Study and become familiar with contract drawings of trades and in particular general construction drawings and details in order to obtain necessary information for figuring installation. Cooperate with other workmen and install work in such a way to avoid interference with their Work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by ENGINEER.

C. Should the requirements of work or systems installed by other trades require specific placement of conduit, apparatus, appliances or other electrical item, these requirements shall be adhered to. Should these requirements result in major deviations in placement from that indicated on the plans or specifications, the condition shall be reviewed by ENGINEER prior to the placement of the work.

D. Any conduit, apparatus, appliance or other electrical item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed and if so shown relocated and reconnected without extra cost. Damage to other Work caused by this contractor, subcontractor, workers or any cause whatsoever, shall be restored as specified for new work.

E. Do not scale electrical drawings for dimensions. Accurately layout work from dimensions indicated on Engineerural drawings unless such be found in error.

F. Report any conflict stated above to supervisor for coordination.

1.7 PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.

1.8 TEMPORARY UTILITIES

A. Contractor shall provide temporary utilities as indicated in Section 015000 during construction.

1.9 WARRANTY

A. The electrical systems are to be warranted to Owner and Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from acceptance of electrical systems by Owner.

B. Contractor warrants to Owner and Engineer that on receipt of notice from either of them within one year of warranty period following date of acceptance all defects that have appeared in materials and/or workmanship, shall be promptly corrected to condition required by contract documents at contractor expense.

C. The warranty above expressed shall not supersede any separately stated warranty or requirements required by law or by these specifications.

1.10 ALTERNATES

A. Refer to General Requirements and description for alternate bid items if applicable.

PART 2 – PRODUCTS

2.1 MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for Contractor to use ingenuity and ability to perform the work to his and Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.

B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage unless noted otherwise on plans.

C. In general, these specifications identify required materials and equipment by naming first the manufacturer whose product was used as the basis for the project design and specifications. The manufacturer's product, series, model, catalog and/or identification numbers shall set quality and capacity requirements for comparing the equivalency of other manufacturer's products. Where other manufacturer’s names are listed they are considered an approved manufacturer for the product specified, however; the listing of their names implies no prior approval of any product they may propose to furnish as equivalent to the first named product unless specific model or catalog numbers are listed in these specifications or in subsequent addenda. Where other than first named products are used for base bid proposal it shall be the responsibility of the Contractor to determine prior to bid time that the proposed materials and equipment selections are products of approved manufacturers which meet or exceed the specifications and are acceptable to the Engineer.

D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Engineer for review prior to procurement.

E. Prior to receipt of bids, if the Contractor wishes to incorporate products other than those named in the specifications or drawings they shall submit a request for approval of equivalency in writing to the ENGINEER no later than (10) ten calendar days prior to bid date. Engineer will review requests and acceptable items will be listed in an Addendum issued to principal bidders. Equivalents will ONLY be considered approved when listed by project addendum. Substitutions after this may be refused at Engineers option.

F. Materials and equipment proposed for substitution shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two (2) copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.

G. In proposing a substitution prior to receipt of bids, include in such bid all costs of altering other elements of the project, including such items as adjustments in mechanical/electrical service requirements necessary to accommodate such substitutions. In addition, all physical space and weight requirements requiring additional structural support, modifications to the base floor plans, equipment concrete pad/roof curb dimensions shall be incorporated as required into such bid to accommodate such substitutions.

H. Within ten (10) working days after bids are received, apparent low bidder shall submit to ENGINEER for approval three copies of a list of all major items of equipment he intends to provide. As soon as practicable and within ten (10) working days after award of contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work for Engineer's review. Where ten (10) working day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certifications that order was placed within ten (10) working day limit.

PART 3 – EXECUTION

3.1 SHOP DRAWINGS

A. Contractor shall furnish shop drawings of all materials and equipment. Submittals shall be submitted electronically. In addition, a minimum of (3) paper copies of any submittal that contains informational drawings or documentation that is in a format larger than 8-1/2 x 11shall be submitted to the A/E. A/E will return the submittals to the Contractor electronically except that a copy of large format submittals will be returned to the contractor via mail. A copy of fully processed product data submittal shall be included as a part of each operating and maintenance manual.

B. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, sizes, etc., that are to be provided. Mark each submitted item with applicable section and paragraph numbers of these specifications, or plan sheet number when item does not appear in specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization. Each catalog sheet shall bear equipment manufacturer’s name, address and phone number. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor shall be required to submit all applicable equipment/material assembly mock-ups as required by the Contract Documents for Engineer approval. Contractor shall provide changes and resubmit mock-ups until Engineer is satisfied final product meets or exceeds stated specifications and quality of specified product.

D. Contractor shall check all shop drawings to verify that they meet specifications and/or drawing requirements before forwarding submittals to the Engineer for their review.

E. All shop drawings submitted to Engineer shall bear Contractor's approval stamp which shall indicate that Contractor has reviewed submittals and that they meet specification and drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed, electrical characteristics, provisions for supply, and drainage connections to building systems. All shop drawings not meeting contractor's approval shall be returned to it’s supplier for resubmittal.

F. No shop drawing submittals will be considered for review by the Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of contractor's review. All comments or minor notations on shop drawings shall be flagged to indicate originator of comment.

G. Engineer will not be responsible for or the cost of returning shop drawing submittals that are submitted to them without Contractor's review and approval stamp. A letter will be sent to Contractor by either the Engineer or Engineer indicating receipt of an improper submittal for pick-up by Contractor or supplier for 15 working days after date of receipt. If not picked up by the 16th working day, submittals not bearing Contractor’s review and approval stamp will be disposed of by Engineer.

H. Engineer's review of shop drawings will not relieve Contractor of responsibility for deviations

from drawings and specifications unless such deviations have been specifically approved in writing by Owner or the representative, nor shall it relieve Contractor of responsibility for error in shop drawings. No work shall be fabricated until ENGINEER's review has been obtained. Any time delay caused by correcting and resubmitting shop drawings will be Contractor's responsibility.

I. The preparation of coordination drawings are not a requirement of the project unless otherwise indicated on the drawings. It is strongly recommended, however, that the various contractors work together to prepare detailed coordination drawings in an effort to minimize conflicts created as the various trades install their particular portion of the work. The design team will assist the contractor in resolving coordination conflicts by reviewing these coordination drawings; however, this review will not constitute any approval of said drawings. There will be no additional compensation for deviations in pipe, ductwork or conduit routing required to achieve coordination of the material and equipment scheduled or indicated to be installed as a part of the project. There will be no additional compensation for the rework of pipe ductwork or conduit should this become required as a result of a lack of coordination between the various trades.

J. Contractor shall submit the following items for this project:

1. All conduit, raceways and cable trays
2. All conductors
3. All junction boxes, backboxes and conduit bodies
4. All wiring devices
5. All switchboards, main distribution panels, and circuit breaker panelboards.
6. All circuit breakers
7. All disconnect switches
8. All motor starters and motor controllers.
9. All lighting fixtures and luminaires
10. Fire alarm and security systems

3.2 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

A. Submit an outline copy of installation, operating, and maintenance manuals for review and comment.

B. Submit three copies of installation, operating, maintenance instructions, and parts lists for equipment provided. After receiving comments from outline review. Instructions shall be prepared by equipment manufacturer.

C. Keep in safe place, keys and wrenches furnished with equipment under this contract. Present to Owner and obtain receipt for same upon completion of project.

D. Prepare a complete notebook, covering systems and equipment provided and installed under this contract. Submit notebooks to Engineer for review before delivery to Owner. Contractor at his option may prepare this notebook or retain an individual to prepare it for him. Contractor shall include cost of this service in bid. Notebooks shall contain following:

1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined under this specification.
2. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
3. A complete set of approved final shop drawings.
4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of the systems installed.

5. As-Built Drawings: The Contractor shall mark up a set of contract documents during construction noting all changes and deviations including change orders. These will be delivered to ENGINEER at end of the project for review and correction as required. After the originals are changed to reflect the blue line set, a complete set of reproducible set of project record drawings drawn at the original scale indicated shall be included in the brochure.
6. All required warranties and guarantees, including start and end date of warranties/guarantees.

E. Provide notebooks bound in black vinyl three- ring binders with metal hinge. Reinforce binding edge of each sheet of looseleaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:

1. Project name and address.
2. Section of work covered by brochure, i.e., Electrical.

F. In addition to the hard copy of the operating and maintenance manuals, provide a digital copy delivered to the Owner on a flash drive, CD or DVD.

3.3 CUTTING AND PATCHING

A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Cut no structural members without Engineer's approval and in a manner approved by him.

B. Patching shall be by mechanics of particular trade involved and shall meet approval of Engineer.

C. Drilling and cutting of openings through building materials requires Engineer's review and approval. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.

3.4 MUTILATION

A. Mutilation of building finishes or existing/new equipment, caused by demolition or installation of new work shall be repaired at Contractor's expense to approval of Engineer.

3.5 WALL PENETRATIONS

A. Include the installation of all boxes, access panels and sleeves for openings required to install the work. All floor and wall penetrations shall be sealed to meet fire rating requirements using materials tested in accordance with ASTM E814. Assume all walls are fire rated.

3.6 OPENINGS, ACCESS PANELS AND SLEEVES

A. Contractor shall provide all boxes, access panels and sleeves for openings required to install his work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls.

3.7 FIRE STOPPING

A. All holes or voids created by the electrical contractor to extend pipe through fire rated floors and walls and shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall be ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M or Hilti Fire Barrier Caulk, putty, strip and sheet forms. Equivalent by SpecSeal.

B. Submit for review firestopping methods and sleeve drawings indicating all required application, methods and sleeves. Refer to engineering drawing for locations of fire rated partitions and floors.

C. All penetrations through walls shall be firestopped.

3.8 SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set all equipment level on adequate supports and provide proper anchor bolts and isolation as shown or specified. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.

B. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best recognized practice. Contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required. Contractor shall verify that structural members of building are adequate to support equipment. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Engineer for review before proceeding with fabrication or installation.

3.9 START-UP, CHANGEOVER, TRAINING AND OPERATION CHECK

A. Contractor shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.

B. All owner training sessions shall be orderly and well organized and shall be professionally recorded using digital format. Contractor shall produce a DVD of each training session and submit to Owner as part of the Operation and Maintenance Manual submittal.

3.10 PRE-FINAL AND FINAL CONSTRUCTION REVIEW

A. At Contractor’s request, Engineer will make pre-final construction review to determine if to the best of its knowledge project is completed in accordance with Contract Documents.

B. Items found by Engineer as not complete or not in accordance with requirements of contract will be outlined in report to Engineer for forwarding to Subcontractors. Subcontractor shall complete and/or correct these items, before notifying Engineer it is ready for final review.

C. All necessary system adjustments, including air systems balancing, shall be completed and all specified records and reports submitted in sufficient time to be received by Engineer at least ten working days prior to date of final construction review.

D. At final construction review, Contractors shall be present or shall be represented by a person of authority. Each shall demonstrate, as directed by Engineer that work complies with purpose and intent of contract documents and shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

3.11 TESTS RECORDING AND REPORTING TESTS AND DATA

A. Record nameplate horsepower, amperes, volts, phase service factor and other necessary data on motors and other electrical equipment furnished and/or connected under this contract.

B. Record motor starter catalog number, size and rating and/or catalog number of thermal-overload units installed in all motor starters furnished and/or connected under this contract. See motor starter specification for instructions for proper sizing of thermal-overload units.

C. Record amperes-per0phase at normal or near-normal loading of each item of equipment furnished and/or connected.

D. Record correct readings of each feeder conductor after energized and normally loaded, and again after balancing of feeder loads as required by current readings.

E. Record voltage and ampere-per-phase readings taken at service entrance equipment after completion of project with building operating at normal electrical load.

F. Submit at least two (2) typewritten copies of data noted above to Engineer for review prior to final inspection.

G. Keep a record of all deviations made from routes, locations, circuiting, etc. shown on contract drawings. Prior to final inspection submit one new set of project drawings with all deviations and changes clearly indicated.

3.12 EXCAVATION AND BACKFILL

A. Perform necessary excavation to receive work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove same at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.

1. Excavation:

a. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
b. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by ENGINEER. Mechanically tamp backfill under concrete and savings in 6” layers to 95% standard density, Reference Division 2.

2. Backfill:

a. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Engineer.

3. Soil Conditions:

a. When available, refer to test hole information on Engineerural drawings or specifications for types of soil to be encountered in excavations.

END OF SECTION 26 0500

SECTION 26 0501 - EXTENT OF CONTRACT WORK AND CODES

PART 1 - GENERAL (Reference Section 260500)

1.1 GENERAL EXTENT OF WORK INCLUDED IN CONTRACT

A. Provide electrical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of electrical systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.

B. Contractor shall be familiar with all equipment provided which requires electrical connections and control. Follow circuiting shown on drawings for lighting, power and equipment connections.

C. Make required electrical connections to equipment provided under this project. Receive and install electric control devices requiring field installation, wiring, and service connection.

D. Check electrical data and wiring diagrams with project voltages, wiring, controls and protective devices shown on electrical drawings. Promptly bring discrepancies found to attention of Engineer for a decision.

1.2 CODES, ORDINANCES, RULES AND REGULATIONS

A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal Governments, and other authorities having lawful jurisdiction.

B. Conform to latest editions and supplements of following codes, standards or recommended practices.

SAFETY CODES:
National Electrical Safety Code Handbook H30 - National Bureau of Standards
Occupational Safety and Health Standard (OSHA) Department of Labor
Safety Code for Elevators ANSI A17.1
International Building Code - 2012

NATIONAL FIRE CODES:

NFPA No. 70	National Electrical Code 2008
NFPA No. 90A	Air Conditioning & Ventilation Systems
NFPA No. 91	Blower and Exhaust Systems
NFPA No. 101	Life Safety Code

UNDERWRITERS LABORATORIES INC.:
All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

MISCELLANEOUS CODES:
ANSI A117.1 - Handicapped Accessibility
Americans with Disabilities Act (ADA)

C. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Engineer in writing before proceeding with work so that necessary changes can be made. However, if Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

D. Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Engineer with request for final review.

E. Contractor shall include in bid any charges by local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exact which part of the work is to be performed by whom.

PART 2 - PRODUCTS

2.1 DRAWINGS

A. Drawings are to be considered diagrammatic for all systems. Conduit runs and circuiting do not show all required offsets and fittings. Contractor shall include in bid costs to provide systems which will avoid and coordinate with all other building trades and systems.

B. Contractor may not share neutrals for multiple circuits, unless specifically noted as such on the drawings.

C. Homeruns for single phase circuits may be grouped together, however, no more than (3) single phase circuits shall be installed in a common conduit. Contractor shall be responsible for properly sizing conduits where homeruns are grouped together per requirements of the National Electric Code.

END OF SECTION 260501

SECTION 26 0525 - SEISMIC PROTECTION

PART 1 - GENERAL

1.1 GENERAL

Note: The requirements for seismic protection measures to be applied to mechanical/electrical equipment and systems specified herein are in addition to any other items called for in other sections of these specifications.

A. Seismic protection for mechanical equipment and components shall be provided by the Mechanical Contractor.

B. Seismic protection for electrical equipment and components shall be provided by the Electrical Contractor.

C. Seismic protection for general construction items, including suspended ceilings, shall be provided by the General Contractor.

D. Refer to Section 22 0525.

1.2 MECHANICAL/ELECTRICAL EQUIPMENT

A. Mechanical/electrical equipment shall include the following items to the extent required on plans or in other sections of these specifications:

Boilers
Expansion Tanks
Water Chiller Units
Control Panels
Pumps with Motors
Light Fixtures
Motor Control Centers
Switchboards (Floor Mounted)
Suspended Ceiling Assemblies
Water and Gas Piping Drain, Waste and Vent Piping
Air and Refrigerant Compressors
Air Handling Units
Switchgear
Transformers
Ducts

1.3 MECHANICAL SYSTEMS

A. Mechanical systems shall include the following items to the extent required on plans or in other sections of these specifications:

Hot Water Distribution Systems
Chilled Water Distribution Systems
Gas Distribution Systems
Water Supply Systems
Sanitary Sewer Systems
Fire Sprinkler Systems

1.4 ZONE

A. This facility is located in Seismic Zone No. 2A.

1.5 EXCLUSION

A. Piping and ducts that do not require special seismic restraints: Seismic restraints may be omitted from the following installations:

1. Gas piping less than 1-inch inside diameter.
2. Piping in boiler and mechanical equipment rooms less than 1-1/4 inches inside diameter.
3. All other piping less than 2-1/2 inches inside diameter.

4. All electrical conduit less than 2-1/2 inches inside diameter.
5. All rectangular air handling ducts less than 6 square feet in cross sectional area.
6. All round air handling ducts less than 28 inches in diameter.
7. All piping suspended by individual hangers 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
8. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of the support for the hanger.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing Manufacturer's figure number, size, location, and features for each required pipe hanger and support.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly or components.

C. Maintenance Data: Submit maintenance data and parts lists for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

D. Shop drawings, along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed below shall be submitted in accordance with the SPECIAL CLAUSES. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

Sway Braces
Flexible Couplings or Joints
Resilient Type Vibration Devices
Smoke Stacks

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT SHALL CONFORM TO THE RESPECTIVE SPECIFICATIONS AND OTHER REQUIREMENTS SPECIFIED BELOW:

2.2 BOLTS AND NUTS

A. Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and B18.2.2, and ASTM A 307 or A 576.

B. Bolts, underground, ASTM A 325.

2.3 SWAY BRACE

A. Material used for members listed in Appendix of this specification, except for pipes, shall be structural steel conforming with ASTM A 36. Steel pipes shall conform to ASTM A 501.

2.4 FLEXIBLE COUPLINGS

A. Flexible couplings shall have same pressure ratings as adjoining pipe.

B. Flexible ball joints conforming to the following requirements may be employed on aboveground piping. Joints shall have cast or wrought steel casing and ball parts capable of 360-degree rotation plus not less than 15-degree angular movement. Joints shall be certified to be suitable for the service intended by the manufacturer, based on not less than 2 years' satisfactory operation in a similar application.

C. Flexible couplings and joints of the mechanical joint type may be used for aboveground or underground piping.

D. Mechanical couplings for steel or cast iron pipe shall be of the sleeve type and shall provide a tight flexible joint under all reasonable conditions, such as pipe movement caused by expansion, contraction, slight settling or shifting of the ground, minor variations in trench gradients, and traffic vibrations. Where permitted in other sections of these specifications, joints utilizing split-half couplings with grooved or shouldered pipe ends may be used.